The Heating and Ventilating Magazine

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

Vol. XVIII. No. 6
$2.00 a year 20 cents a copy

JUNE, 1921

New York Office, 1123 Broadway
Published at Cooperstown, N. Y.

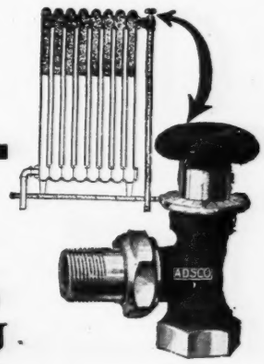
No Air Valves, No Radiator Traps No Costly Overheating

FILLING radiators with steam on mild days is useless waste. Adsco Heating uses any desired portion of radiator—its perfect control of radiation saves 20 to 30% Fuel Cost. Adsco Heating uses no Air Valves, Radiator Traps, Return Traps, Vacuum Pumps, etc. These are expensive and unnecessary.

Adsco is silent. It is the most commonsense heating system—so free from complicated devices that it can be bought and installed for 15 to 20% less than most other systems.

AMERICAN DISTRICT STEAM COMPANY
GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.
BRANCHES
New York Chicago Seattle

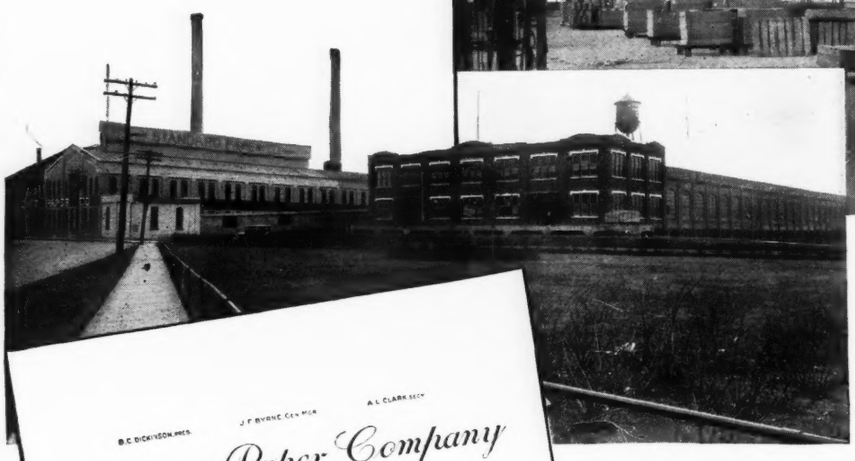
Ask about Adsco Heating of building groups from Central Station Steam Plant—Bulletin 20-H; for individual buildings, Bulletin 150-H.



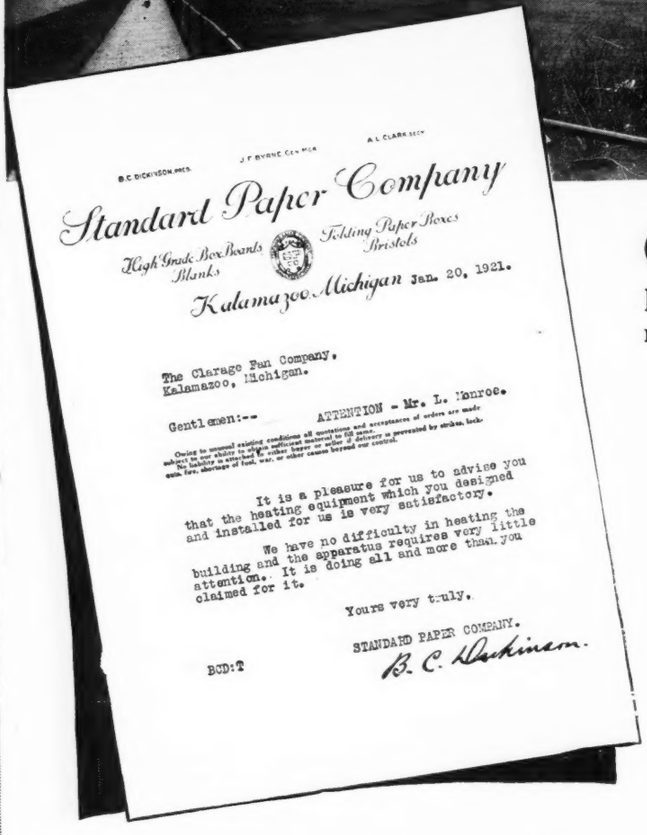
ADSCO HEATING

CLARAGE
KALAMAZOO

ONE COST— for Both Heating and Ventilation



A Clarage System was installed over a year ago in this new Paper Box Factory of the Standard Paper Co., Kalamazoo, Michigan. The interior view gives a glimpse of the piping and fresh air outlets. Clarage Engineers designed the entire heating and ventilating system. G. G. Worden of Kalamazoo was the Architect for the building.



B. C. DICKINSON, PRES. J. F. BYRNE, GEN'L MGR. A. L. CLARK, SEC'Y

Standard Paper Company

High Grade Box Boards Blanks — Folding Paper Boxes Bristols

Kalamazoo, Michigan Jan. 20, 1921.

The Clarage Fan Company,
Kalamazoo, Michigan.

Gentlemen:— ATTENTION - Mr. L. Monroe.

Owing to unusual existing conditions all quotations and acceptances of orders are made subject to our ability to secure sufficient material to fill same.
We hereby are not responsible for any other delay or failure in delivery as prevented by strikes, lockouts, fire, shortage of fuel, war, or other causes beyond our control.

It is a pleasure for us to advise you that the heating equipment which you designed and installed for us is very satisfactory.

We have no difficulty in heating the building and the apparatus requires very little attention. It is doing all and more than you claimed for it.

Yours very truly,

STANDARD PAPER COMPANY.

B. C. Dickinson.

BCD:T

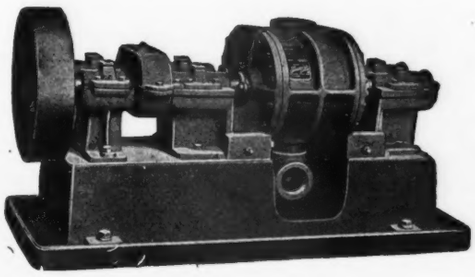
ONE first cost covers both heating and ventilation, if you install a Clarage Fan Blower System. And this cost is not excessive.

With a Clarage System, your workmen have fresh, pure air from out-of-doors the year around —warmed in winter, cool in summer. This good, wholesome air in your factory will keep your workers wide-awake and on their toes every minute. Further—the equipment located in one place, offers economy of space, reduces the cost of steam connections, and affords control by one man.

Why not have our engineers cooperate with you on your heating problems? Write, wire or phone us today.

Clarage Fan Company
404-10 Porter Street
Kalamazoo, Michigan

Manufacturers of Fans, Blowers, Heaters, Engines, etc.



"Now is the Time to Replace, Repair and Improve Equipment"

This sound advice is given by the editor of a machinery trade journal, but will apply as truly to your heating plant. When the system is closed down is the best time to inspect piping, traps, pumps and boiler. Needed adjustments can then be made.

If your system includes a Connersville Vacuum Pump, write us for estimated costs of repairs or replacement.

The Connersville Blower Company

Connersville Indiana U.S.A.

Chicago, 1431 Monadnock Block New York, 114 Liberty Street

Marsh Reflux Junior Thermostatic Traps

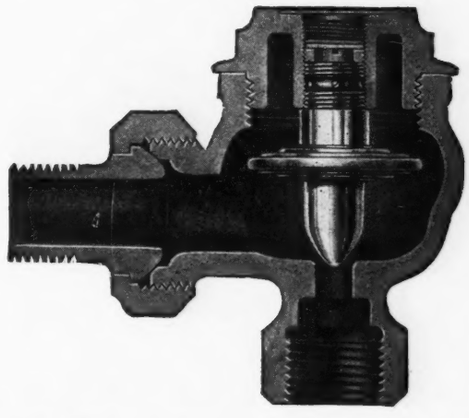
For Radiators and Coils of "Low Pressure," "Vapor" and "Vacuum Heating Systems"

FREELY DISCHARGES AIR AND WATER WITHOUT LOSS OF STEAM

THE Marsh REFLUX Return Line Trap is for use on the return end of radiators of low pressure, vapor or vacum systems of heating. It is the result of a careful investigation into the actual requirements that must be fulfilled by a radiator return valve, in order that it may accomplish what is desired of it, namely, **to free the radiator of air and water without the loss of steam** and to do so **noiselessly.**

The Marsh Reflux Junior Thermostatic Trap is recommended for small radiators and coils. This Trap for the small and the Original Reflux for the large units will make an ideal job. Especially adaptable for two pipe gravity work and vapor systems.

May be furnished either sealed adjustment (as illustrated) or with outside adjustment.



Write for literature fully describing this Trap

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For the New and Urgent Heating Situation.

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THE present imperative demand for more building will in turn create a corresponding demand for heaters—and this situation comes at a time when coal economy is becoming more and more necessary.

If you will offer to install a heater, the economies of which will be emphasized by any future increase in coal costs, you will obtain a maximum share of the heater business from this building expansion and certainly strengthen your good will.

The Spencer will do this because it burns the cheaper grades of small coal (No. 1 Buckwheat)—and burns no more tons than other heaters burn of the higher priced large coals. And with the Spencer, the less expensive Buckwheat is burned at an even heat with less attention than is necessary with ordinary heaters burning the larger coal.

Successfully Burns No. 1 Buckwheat

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THE STANDARD HEATER COMPANY

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Smokeless Boilers

should be specified by you on every installation requiring a boiler especially constructed for burning soft coal smokelessly. Here are just a few of the good points which will interest you and your client.

Burns any kind of coal smokelessly and without waste.

Does not require frequent attention or special method of firing.

Excess air easily controlled at feed door.

All grate connections are outside the boiler.

Dry steam without expensive pipe headers.

Many other special features explained in Bulletin 1436 H.

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The Toledo Pipe Threading Machine Co., Toledo, O.

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PORTABLE POWER

KEWANEE

Grate Surface Properly Proportioned with Heating Surface

The grate and combustion chamber of a boiler *make* the heat---the heating surfaces *use* it by giving the water in the boiler a chance to absorb it.

So the heating Surfaces must be big enough to allow *all* the heat manufactured in the combustion chamber to be absorbed by the water. If the heating surface is not properly proportioned with the grate a lot of the heat will be wasted up the stack.

All Kewanee Boilers are properly proportioned so that all of the heat can be absorbed by the water. That is another reason they are so easy on the coal bill.

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Steel Heating Boilers, Radiators, Tanks, Water Heating Garbage Burners

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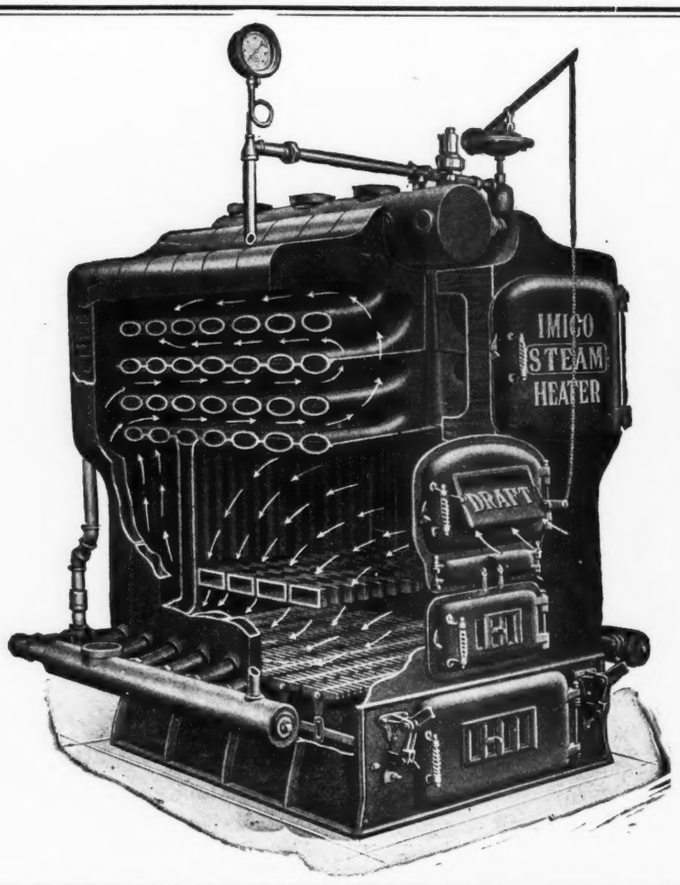

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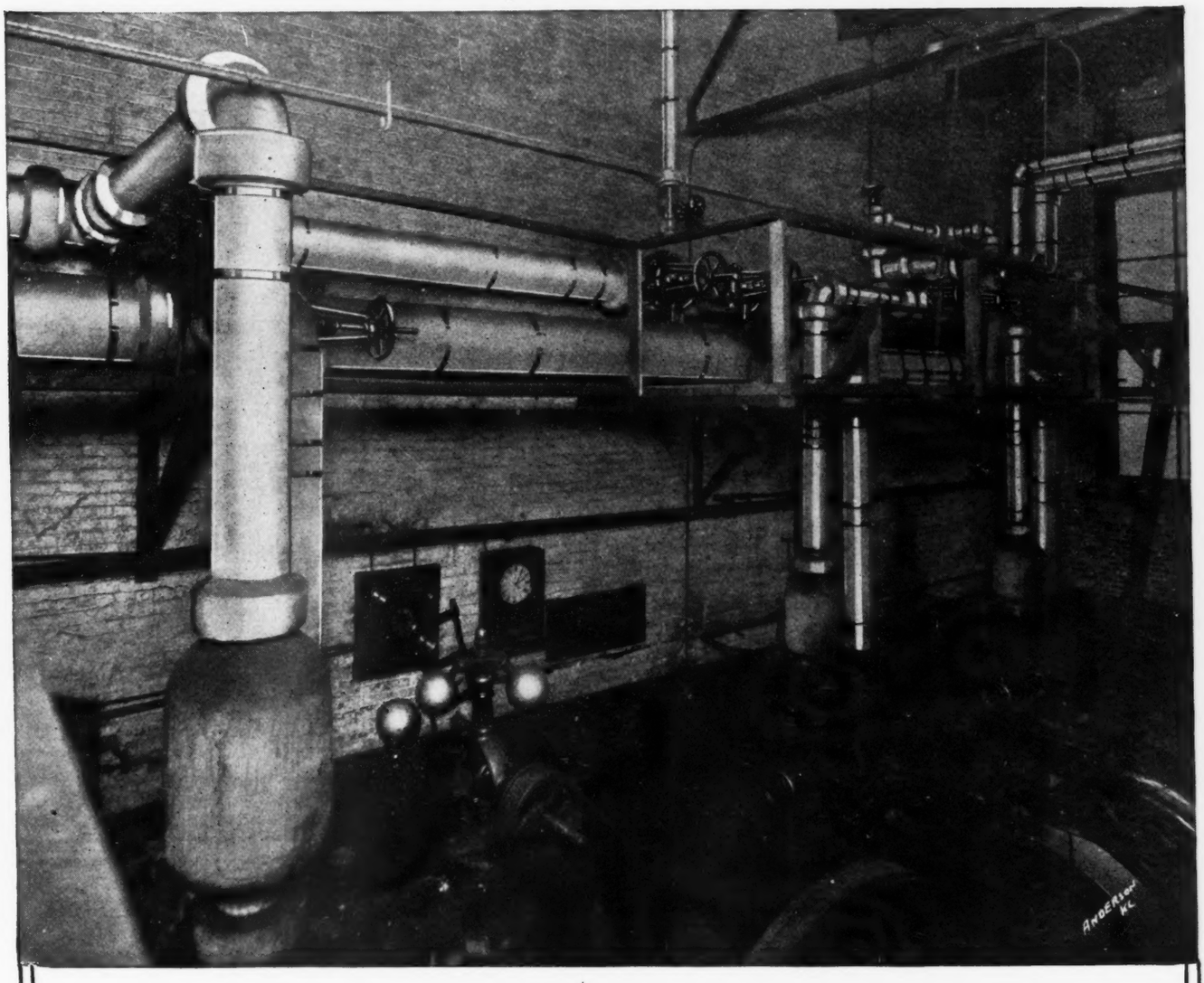

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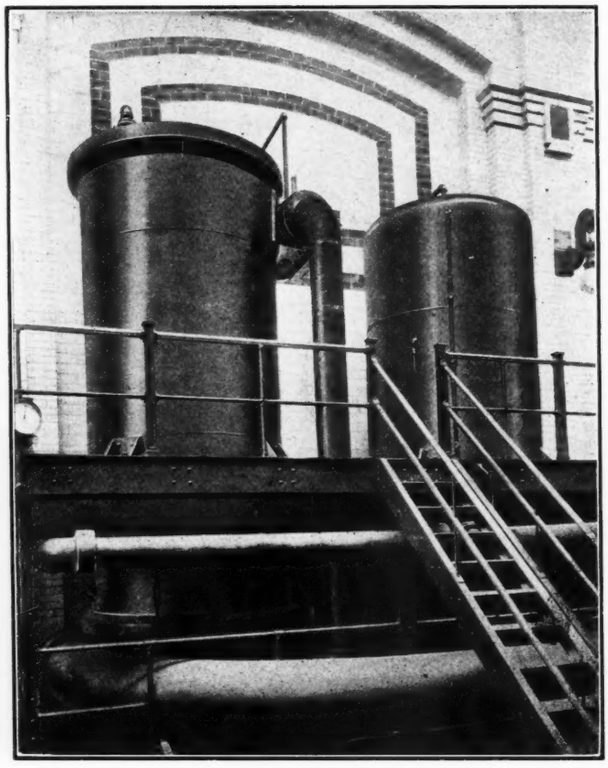

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Heaters
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Made in 2″, 4″, 7″ and 10″ sizes

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For Low Pressure and Hot Water Boilers

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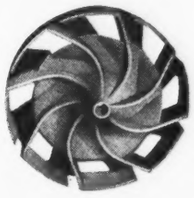
Eliminates the Human Factor



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A cleaner that's always ready for instant use--that's proof against clogged screens---that's free from dirt tanks or buckets is found in the Connersville Centrifugal Separating Type Vacuum Cleaner

A fluted rotor revolving within an iron case automatically separates the incoming dirt and air.

All dirt is discharged continuously in a liquid condition directly into the sewer.

You can get the Connersville Centrifugal Separating Type Vacuum Cleaner in all sizes up to twelve sweeper capacity.

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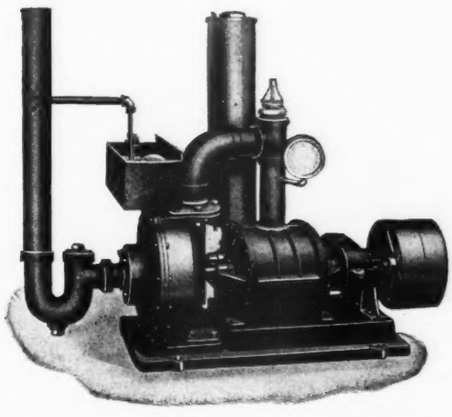

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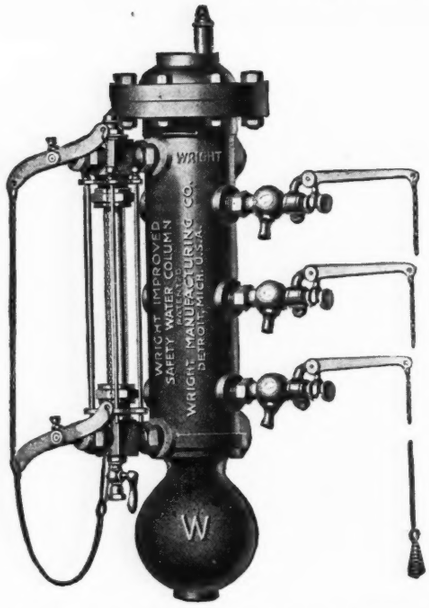

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and Gauge Cocks

Wright Safety Water Alarm Columns Protect Power Plants Everywhere

Because they stand ready to shrill out their warning of low or high water—

Because they save fuel—

Because they prevent boiler expansion and contraction, Wright Safety Water Alarm Columns are to be found in an ever-increasing number on modern power plants—large and small.

By insuring a uniform water level, the Wright Columns prevent loss of heat and waste of fuel resulting from a continually varying water level.

Steady water also means dry, elastic steam and elimination of the drawing over of "slugs" from boilers to cylinders, which frequently results in blown out cylinder heads or the complete wrecking of the engine.

With thousands of Wright Columns protecting boilers of all kinds throughout the country, they are an important factor in the gradual decrease of boiler explosions.

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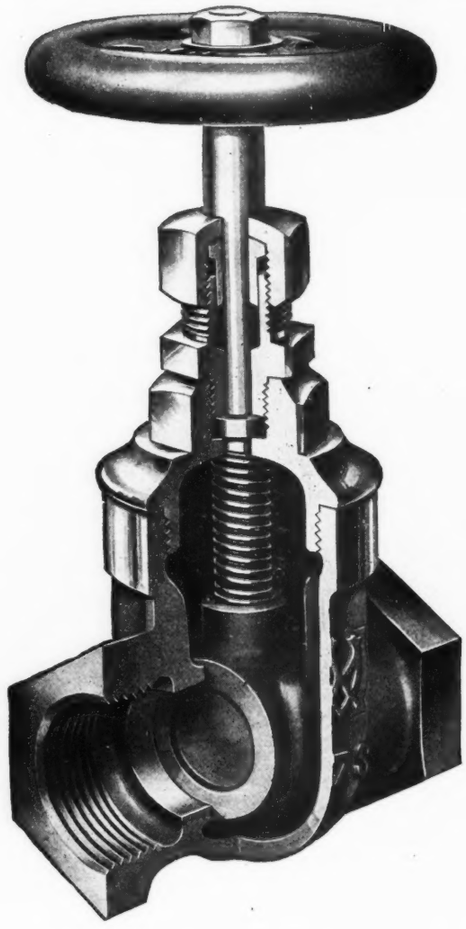

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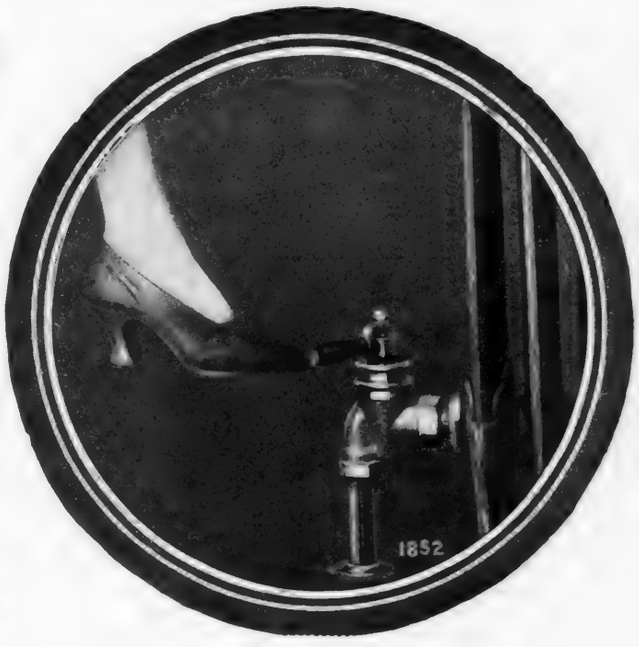
GORTON
QUICK-OPENING
VALVE

It moves with a touch of the foot or hand—quarter turn does the trick. Prevents opening a window to cool a room quickly (with resultant waste of steam and coal) for it is easier to operate the radiator with Gorton valve than it is to open windows.

There's a real saving for both your client and yourself in our suggestion that you write for full particulars.



No stooping. The slightest touch of the foot operates the valve.

Here are the Details of this Remarkable Valve

A. The valve with a packing lock—Acknowledged the best type of valve packing.

B. A ground ball shoulder fitting on a ground seat, Steam and water tight, and stays tight.

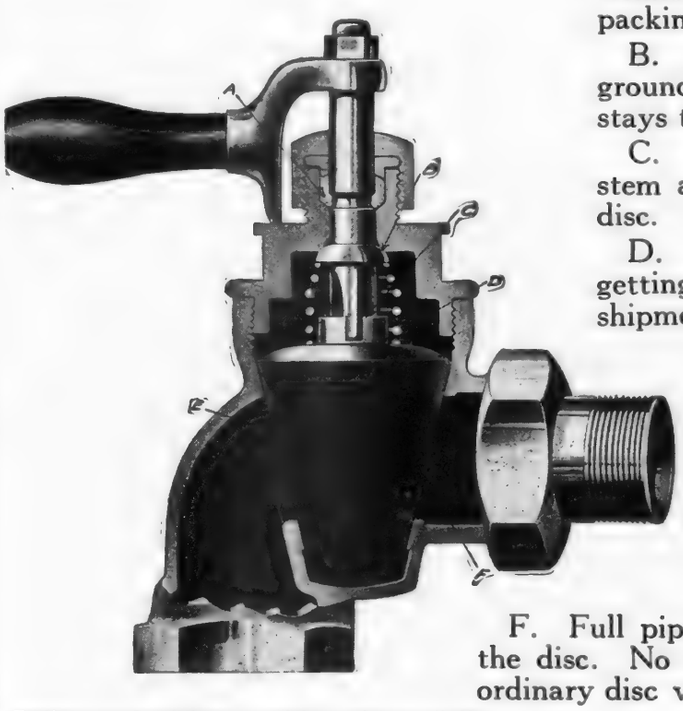
C. Loose joint connection between valve stem and disc—insuring perfect seating of disc.

D. Bronze spring prevents grit or dirt getting between disc and valve seat during shipment.

E. Mineral composition disc, no metal, sulphur nor rubber. Disc and seat both machine ground to a perfect taper surface, giving perfect seat.

A combination proof against rusting, wedging, cutting, abrasion and leaking.

F. Full pipe size unobstructed passage through the disc. No obstruction to passage of steam as in ordinary disc valve.



Radiator or Straightway—with or without Union

Equip your Radiators with Gorton Valves and save money on the coal pile

GORTON & LIDGERWOOD CO., 100 Liberty St., New York, N. Y.

See Sweet's Architectural Catalog, page 1757, for Specifications—Write for Catalogs.

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TRADE MARK

Roosevelt School, Union Hill, N. J. Equipped with 40 Univents.

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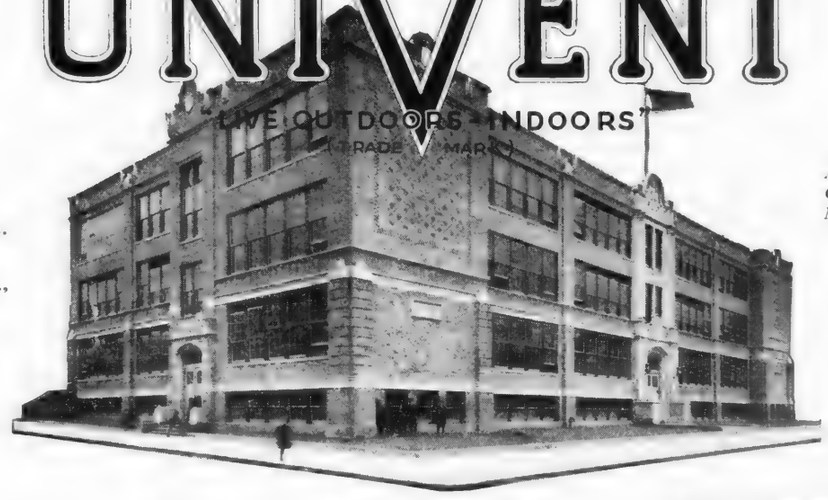

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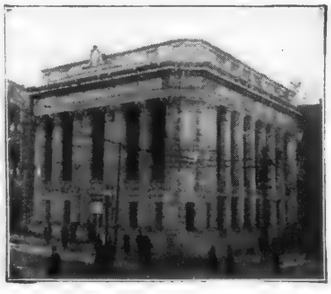

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Results—Without "Come Backs"

When you have installed the Univent system of ventilation, you can be sure of these things: (1) you have added prestige to your business; (2) you have made a satisfied customer—and will keep his good will; (3) the installation will never go back on you.

It is the simplest, easiest system to "sell" to a prospect, because it has so many things in its favor. It conserves space. It cuts building costs many dollars. It eliminates cumbersome ducts and flues—it won't get out of order. The Univent installations shown give positive proof of the system's wide and growing popularity.

Write for full Engineering Data

To contractors and engineers interested in this improved method of ventilation we will gladly send our Catalog and Engineering Data Book upon receipt of a request on your business stationery. Write Department F.

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Moline Illinois

Grade School, Creston, Iowa
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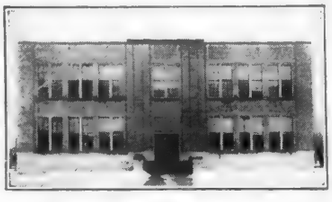

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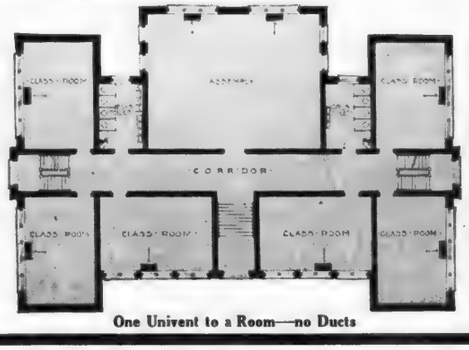
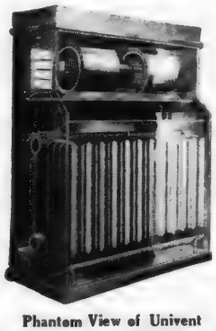
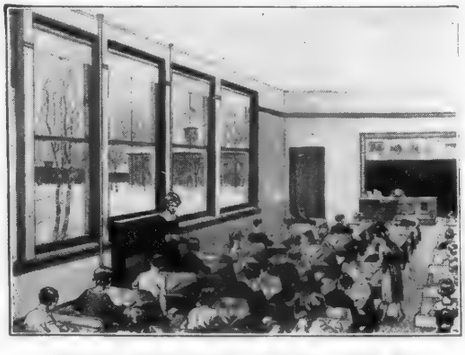


One Univent to a Room—no Ducts



Phantom View of Univent



Classroom Showing Univent Installation—Note Size

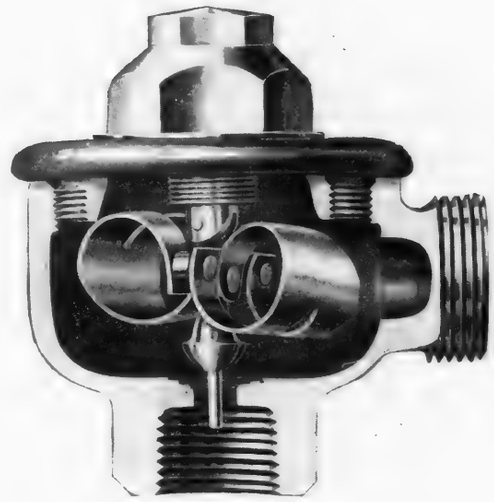
Where Permanency Pays

IN modern building construction, strength, durability, permanency, are considered in every department of building design.

This was the thought back of the *all-metal* Trane Thermetal Trap,—the radiator trap, that combines sensitiveness in operation with all-metal permanency and durability.

It is a trap without a diaphragm, with no liquid to leak out or give out and render its force inoperative.

Trane Thermetal Traps are used on all kinds of two pipe heating systems and in buildings of every description. For more complete information and test records write for Bulletins No. 6 and No. 6-A.



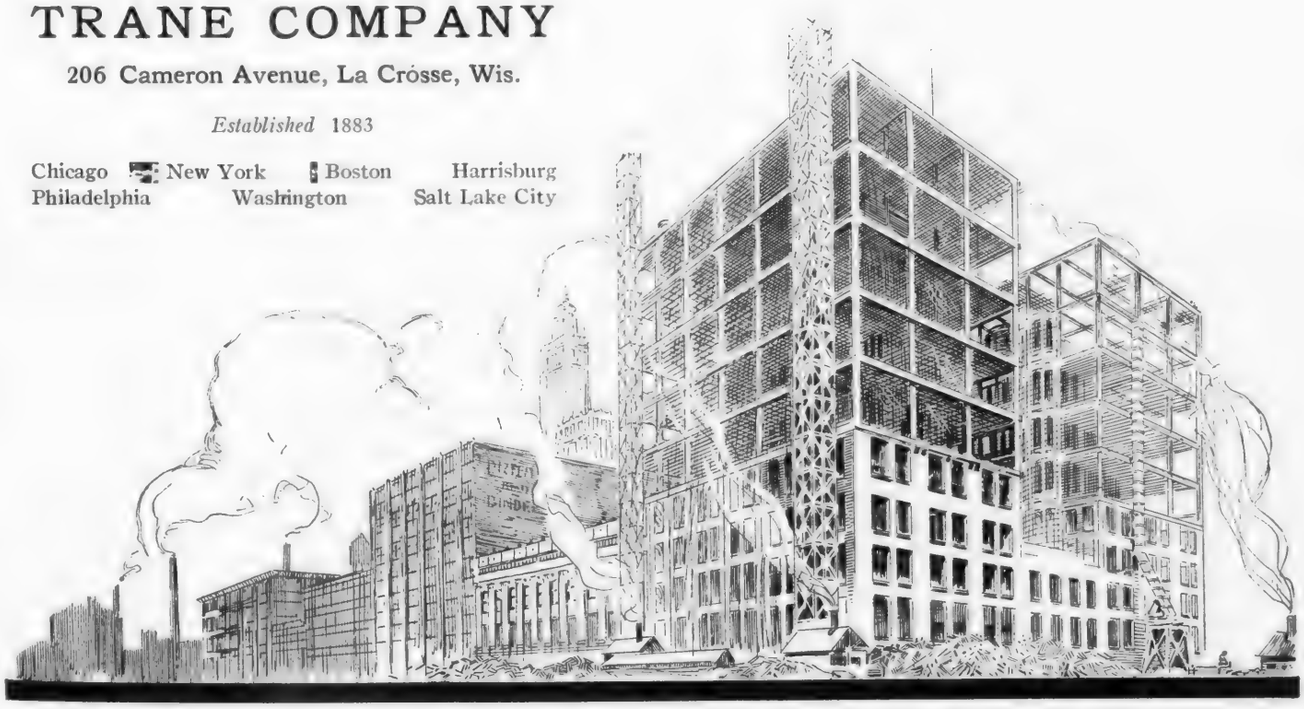
"The Trap without a Diaphragm"

THE
TRANE COMPANY

206 Cameron Avenue, La Crosse, Wis.

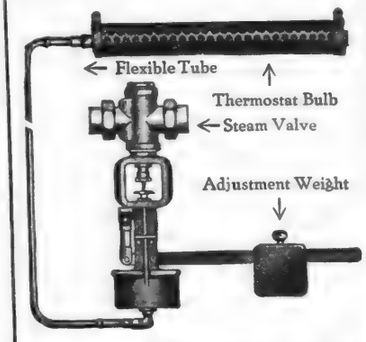
Established 1883

Chicago New York Boston Harrisburg
Philadelphia Washington Salt Lake City



Trane Thermetal Traps

Men Forget, Machines Cannot



The Powers Regulator No. 15

Specially adapted for control of air temperatures in ovens, kilns, etc. Write for Bulletin No. 138. There are other Powers Regulators for other places---acid baths, hot water tanks, etc.

Wherever there is need for maintaining a definite, uniform temperature—as in drying rooms, ovens, vats, kilns, etc.—men may forget—but machines cannot.

You depend on men to watch the temperatures but they are only human and, as careful as they try to be, they have allowed valuable material to be spoiled.

The Powers Automatic Heat Regulator

Built scientifically in accordance with known physical laws. Self contained; entirely automatic; can be adjusted to maintain any desired degree of heat; stays on the job every minute and does not forget to "turn 'er on" or off when the temperature even approaches the danger point. Prevents loss and damage and worry. Set the Powers Regulator and you can depend on results.

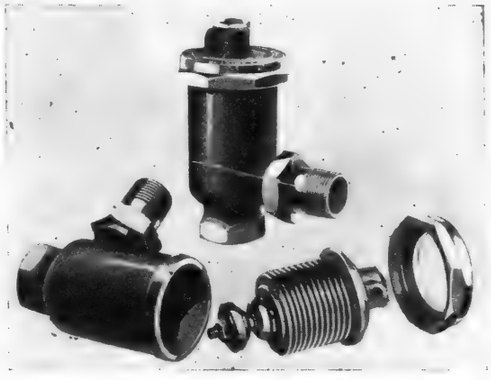
The Powers Regulator Company

Specialists in Automatic Heat Control

954 Architects Bldg. NEW YORK
2718 Greenview Ave. CHICAGO
565 Boston Wharf Bldg. BOSTON

The Canadian Powers Regulator Co., Ltd., Toronto, Ont.

(1263B)



B & B Pneumatic Valve

When it comes to Heating, specify the B. & B. Heating Specialties and B. & B. Temperature Control System. You will find the B. & B. Specialties will always give you the best of service—for service means—DURABILITY—SIMPLICITY—and the sectional cuts illustrated show these features: which means that your repair bills are going to be eliminated. We refer you to such buildings as the

DURANT BUILDING, DETROIT, MICHIGAN—Temp. Control and Vacu Traps;
HANNA BUILDING, CLEVELAND, OHIO—Multiflex Traps;
PENNSYLVANIA HOTEL, NEW YORK, N. Y.—Temp. Control;
and thousands of similar buildings.

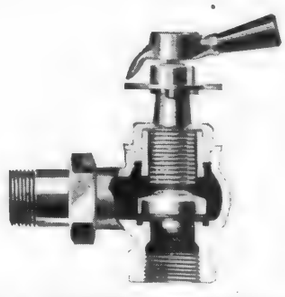
Literature sent upon request

THE BISHOP & BABCOCK COMPANY

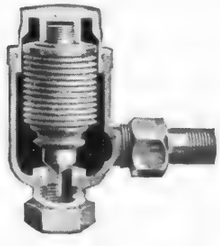
General Offices and Factories, CLEVELAND, OHIO

The B & B Line

QUALITY **SERVICE**



B & B Multiflex Modulation Valve



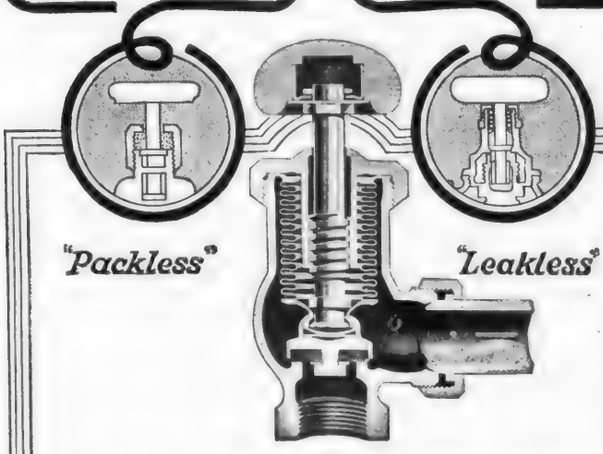
B & B Multiflex Trap

SYLPHON

The Valve without a Fault.

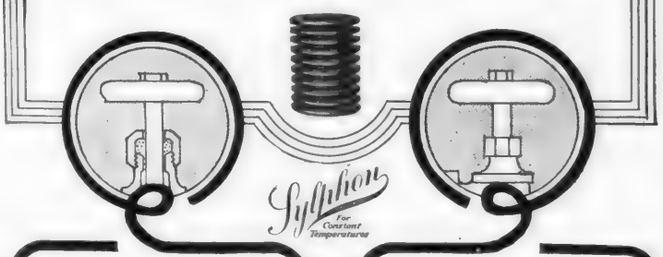
Composition Rings and Cotton wick packing are used in this so-called Packless Valve. The rings soon wear out causing the valve to leak.

In this so-called Packless Valve ground joints take the place of the ordinary cotton-wick packing. These soon wear down thru friction, making it necessary to renew them at intervals.



Years of bitter experience have taught reputable Architects and Contractors that it does not pay to use a cheap, inferior radiator valve that requires packing and adjustment every year or so. There are many so called "Packless" valves on the market. The majority of these have one or more of the disadvantages in construction as shown in the circles on this page. The SYLPHON PACKLESS radiator valve is the only valve that has NO PACKING—NO COMPOSITION DISCS, and NO METAL RINGS. There are no rotating or sliding parts exposed to steam or water and the valve CANNOT LEAK. The SYLPHON PACKLESS radiator valve permanently and positively insures the owner against all renewal expense. The valve is known as our "Government Pattern" and has been approved by the United States Government.

There's a Fulton Agent near you—he'll be glad to explain and demonstrate. Send for Pamphlet W.



In this type of valve cotton-wick packing is used which necessitates repacking every eight months or so.

Compare the beautiful rosewood, non-burning handle of the Sylphon Valve with this valve where exposed metal places one in danger of having the hand burned.

THE FULTON COMPANY
KNOXVILLE, TENN., U.S.A.

BRANCHES:

New York, Hudson Terminal Bldg. 50 Church Street
Detroit, 1247 Washington Blvd.
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Representatives in all large centers.
The largest plant in the World devoted to the manufacture of thermostatic instruments.

More in Your Favor

—with

Mel-Rock Air Washers

MEL-ROCK Air Washers possess many exclusive points of advantage, which are of high value. For instance:

EACH CAPACITY is made in from four to seven different proportions, so that any space and head-room may be accommodated.

MEL-ROCK Eliminator Systems are made in batteries, riveted at the factory. This saves you considerable time and money in setting up.

MEL-ROCK Mist Nozzles discharge a greater volume of mist, at low pressure.

MEL-ROCK stands .or the very highest development in air-washing efficiency and economy.

Send for descriptive catalog.

TO AGENTS—There is still some good, exclusive territory open. Write for particulars.

MEL-ROCK PRODUCTS
TRADE-MARK

MELLISH & HAYWARD COMPANY
213 West Austin
CHICAGO

DESCRIPTION

Instantaneous zero setting without use of key. Jewelled bearings. Enamel dial boldly figured. Threaded socket for attaching to foot, permitting use in otherwise inaccessible places. English sole leather carrying case. Calibration charts for velocities up to 3,000 feet per minute.

Tycos

Anemometer

Measures air currents of 100 to 3,000 feet per minute in mines, tunnels, shafts, airways, etc.

Taylor Instrument Companies

ROCHESTER, N. Y.

There's a *Tycos* or *Taylor* Temperature Instrument for every purpose

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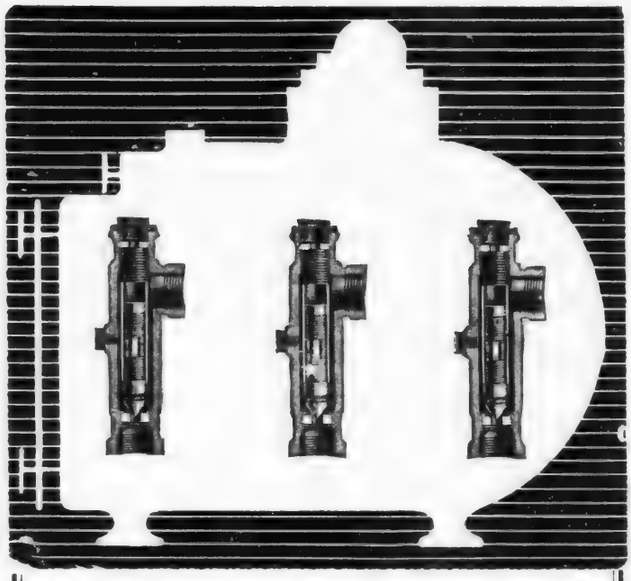


Three Traps for Price of ONE

If you are willing to pay for mere *bulk* you will surely get it in the cumbersome float or bucket trap with its impressive array of floats, levers, water gauges, bowls, toggles, packing and other superfluous parts.

But, if you are more interested in *results achieved* by a steam trap than in mere *size* of the apparatus—if you want *real efficiency* unimpaired by trouble-making mechanical contraptions, you will get exactly what you want, *at one third the price*, in

STEAM TRAP SARCO

This is a *simple, compact* Steam Trap with all unnecessary mechanism eliminated. Therefore the Sarco occupies but a fraction of the space required by bucket or float traps. It can be installed at any point on the line without any change of piping. No platform, pit or supports needed.

Steam Trap Sarco opens *promptly* to drain off the condensate—and closes just as promptly to prevent the loss of live steam.

Made in sizes from ⅜-in to 3-in., and is guaranteed for pressures up to 200 lbs.

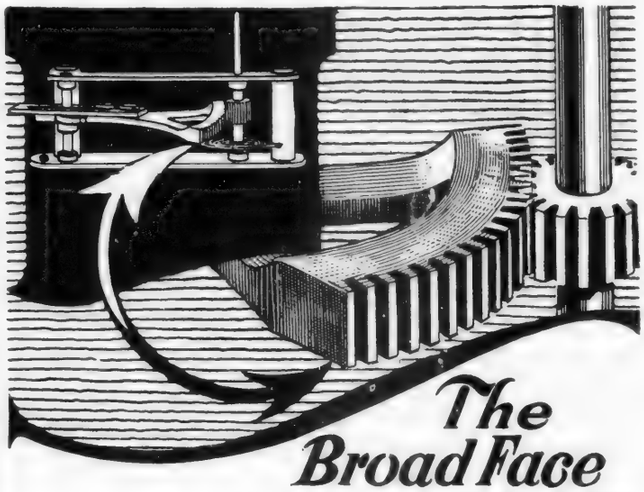
It *insures* you of greater efficiency, and at the same time permits you to save two-thirds of your steam trap costs.

Send for Booklet P 12 and particulars about the 30-day free trial offer.

SARCO CO., Inc.

231 Broadway, New York City

Chicago Cleveland Buffalo
Detroit Philadelphia



The Broad Face gives ENDURANCE

Gears that do heavy work must be broad-faced in order to stand the wear-and-tear.

Note the unusually broad face of the segment illustrated above, and the corresponding broad face of the pinion. The wide working surfaces of these two units reduce wear on the teeth to a minimum in

AMERICAN GAUGES

The segment itself is made of specially hard cast bronze, while the shafts and bushings of both segment and pinion are made of the same wear-defying metal. Both segment and pinion shafts also rest in phosphor bronze bushings to further reduce wear.

All the way through, these gauges are built to withstand the most exacting service.

The ability of an American Gauge to resist wear means not only long life—it means that, between segment and pinion, there is a minimum of "play" or "lost motion," which is another way of saying that these accurately constructed gauges RETAIN THEIR ACCURACY long after ordinary gauges are worn out.

Another thing that insures ACCURACY is that each dial is hand-calibrated—each one designed particularly for the gauge on which it is applied.

For dependability and economy American Gauges are in a class by themselves.

Our Gauge Catalog No. 70 tells the story in convincing detail. May we send you a copy?

American Steam Gauge & Valve Mfg. Co.

Boston, Mass.

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Chicago Pittsburgh

ALLEN AIR-TURBINE VENTILATOR

Standard of Ventilating Efficiency

The Allen Ventilator is an *air-driven* rotating suction turbine. It creates a *mechantically forced action*, precisely the same as expensive steam or electrically driven systems.

Therefore its air displacement capacity is positive, dependable, *measurable and guaranteed.*

But its low initial and installation cost is also the final cost. It *eliminates all operating expense*, care, expert attention and up-keep.

Patented

CARRIES OFF
GASES
MOISTURE
STEAM
SMOKE
VAPOR
FOUL AIR
ODORS
HEAT
FUMES
DUST
DAMPNESS

ASK A USER - HE KNOWS

Allen Air-Turbine Ventilators are unaffected by snow, ice, sleet or rain. *They are positively leak-proof*, and the powerful, continuous upward suction flow of air make *down drafts impossible.*

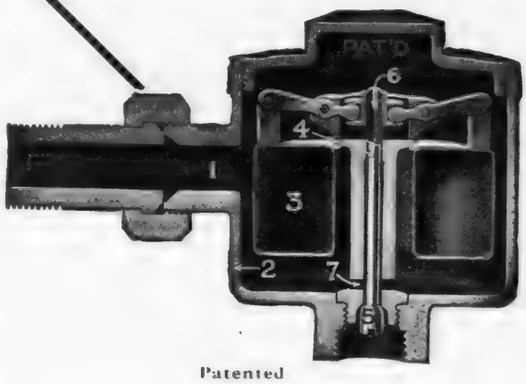
Wherever ventilation is desired—in factories, foundries, stores, schools, hotels, churches, theatres, residences, kitchens, bakeries, tanneries, barns, stables, garages, chimneys, air shafts, or wherever air circulation is required, Allen Air-Turbines *have proven the best, cheapest and most efficient* ventilating system known.

Many of America's largest industrial concerns have adopted and endorse the Allen Air-Turbine Ventilators.

Write for Detailed Literature

ALLEN AIR-TURBINE VENTILATOR CO.
DETROIT Eighth and Porter Sts. **MICHIGAN**

A Steam Trap that Automatically Eliminates Air and Water Condensation Without Allowing Escape of Steam



Patented

THE McDonald Under-Seat Valve is the only valve of its kind on the market. The principle of operation is positive and noiseless. It gives perfect service on any radiator on a two-pipe heating system and under any ordinary pressure up to ten pounds. Handles and discharges a much larger quantity of water than any other trap or valve of equal size. Self-cleaning. Carries away all scale. Entire inside instantly removable by loosening cap. Saves every ounce of steam. Its economical features are greatly appreciated by the building owner.

Leading architects, heating engineers and contractors are specifying and installing large numbers of the McDonald Under-Seat Valve, because its superior features have been proven in service.

Write for detailed information

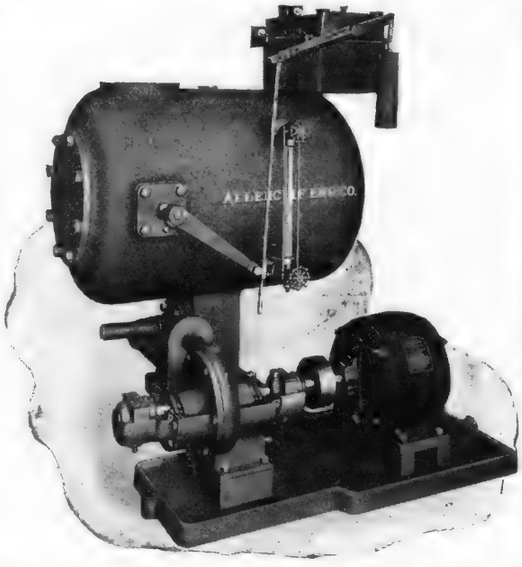
The McDonald Under Seat Valve Co.

602 Swetland Building **CLEVELAND, OHIO**

USE "ALLENCLIF" AUTOMATIC CONDENSATION UNITS

FOR LOW PRESSURE STEAM-HEATING SYSTEMS

FOR CONTINUOUSLY SATISFACTORY SERVICE



A design, based on experience, which fulfills the exacting requirements of continuous operation.
A pump with two bronze bushed ring-oiling bearings.
Materials which resist the destructive action of hot condensate.
Interchangeable parts.
All working parts easily accessible.
The results to users:
Economy in power—
Uninterrupted service—
Low up-keep expense.

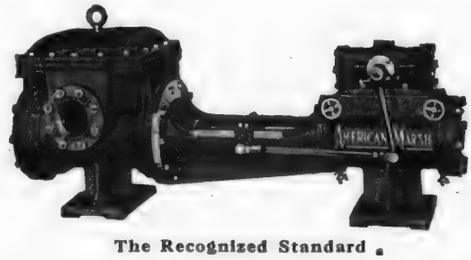
THE ALLENCLIF ENGINEERING COMPANY

638 E. LIVINGSTON AVE. WRITE FOR BULLETIN No. 2 COLUMBUS, OHIO

American-Marsh Pumps

for Heating Systems

For use in returning the condensation to the boiler on heating systems where the steam pressure is too low to operate a steam pump. Water is returned to the boiler in its hottest state. Equipped with an automatic float valve which is positive and reliable.



The Recognized Standard

American-Marsh Vacuum Pumps have been recommended and specified by a majority of the leading heating engineers and Contractors for over twenty years.

Made with only best of material and workmanship. Highest efficiency guaranteed.

Equipped with an improved steam valve which is especially adapted for vacuum service. American-Marsh Pumps are positive in action, possess a perfect governing element and will not hang up under all the varying conditions.

Ask for Bulletins Nos. 24 and 27

AMERICAN STEAM PUMP CO.

Battle Creek, Mich.

Our slogan: Simplex not Duplex. "To be simple is to be great"

Air Conditioning

A SPECIFICATION

is a word picture of an engineering ideal. We specify the results to be obtained, and our guarantees of operation and maintenance insure maximum service, best equipment, sure success.

Full information and catalogue, covering all phases of air conditioning work, can be obtained by requesting a personal call or by correspondence.

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"THE CLIMATE DOCTORS"

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COOLING SYSTEM, BUTTERINE FACTORY

Sturtevant APPARATUS

Webster ESTABLISHED -1888-

Chamber of Commerce and Annex, Minneapolis, Minn., equipped with a Webster System of Steam Heating.

Webster

Systems of Steam Heating

The Webster Systems of Steam Heating are built in the light of 33 years of experience in meeting every conceivable kind of steam heating problem. This experience is placed freely and without obligation at your service in helping to plan and erect a steam heating installation that will be permanently satisfactory and a credit to all concerned. Over 10,000 Webster installations have demonstrated the mechanical excellence of Webster equipment and our ability to meet any operating condition. Let us help you plan your next installation.

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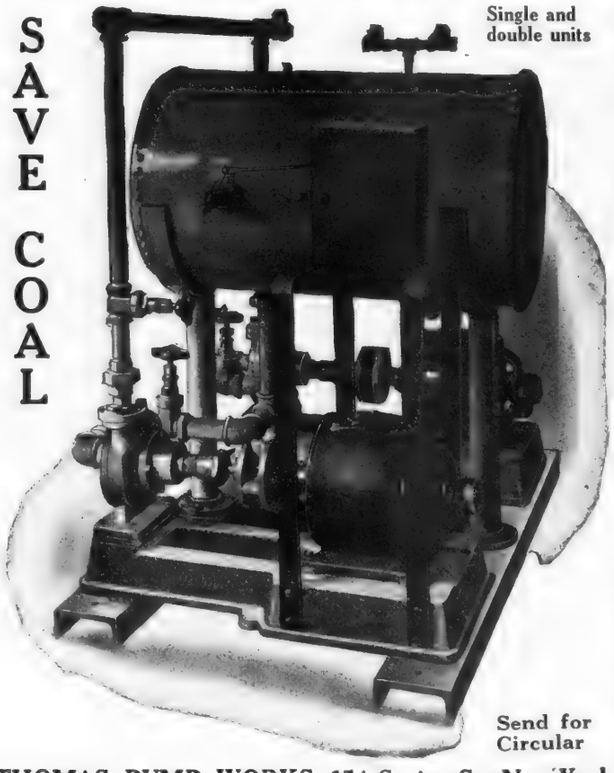
of all descriptions and sizes

Single and double units

SAVE COAL



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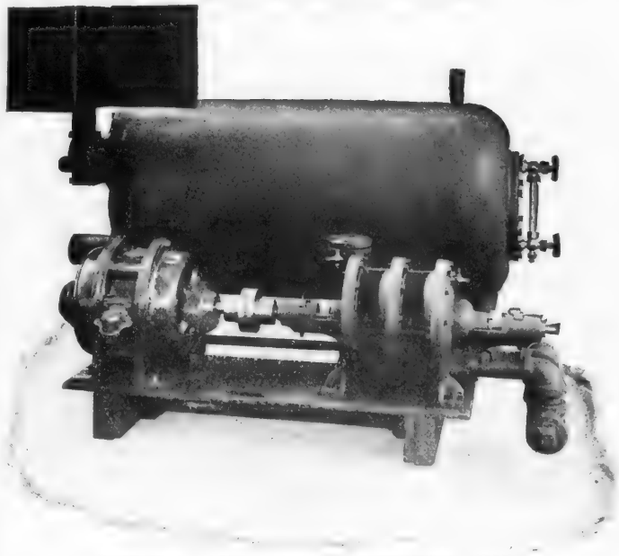
ELECTRICALLY OPERATED

CONDENSATION RETURN PUMPS

HORIZONTAL AND VERTICAL



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RUGGED RELIABLE

Constructed to insure long life.

Superiority proven by years of experience.

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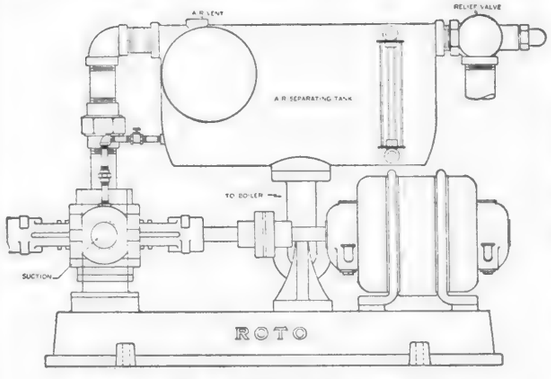
A POWERFUL VACUUM MEANS

A Successful Heating Job



THE ROTO VACUUM AND BOILER FEED PUMP

Handles lots of air

A Single Pump---Only Two Pipe Connections

SURE - RELIABLE - SIMPLE

ROTO PUMP MFG. CO.

1260 Park Place DETROIT, MICH.

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AN INNOVATION IN VACUUM RETURN LINE PUMPS. IF YOU DESIRE TO ELIMINATE STUFFING BOXES CORROSION AND EROSION OF WORKING PARTS ASK US

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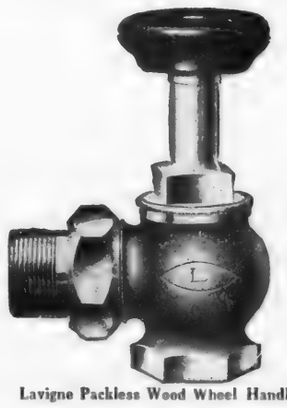

Lavigne Packless Wood Wheel Handle

LAVIGNE

PACKLESS
QUICK-OPENING
STEAM
RADIATOR VALVES

have been tested by a great many years of strenuous service and the engineering principles involved in their construction have been proven absolutely correct.

These Valves

positively do not leak air, water or steam. Open quickly and close just as quick. Are correctly proportioned and properly manufactured.

BUILT RIGHT---TO STAY TIGHT

Made in six sizes, many styles of handles

All good jobbers handle them

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Detroit, Mich.

PATTERSON

Preferred by those who recognize true merit in a water Heating System

Automatic, requiring no adjustment — and no attention whatever

Temperature is uniform under all variations of service

Time is saved by having an unlimited supply of scalding **hot water**

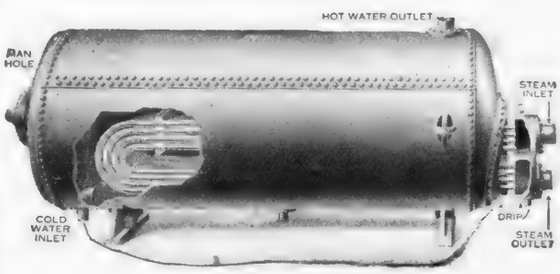
Efficient and economical. Materials and workmanship unexcelled

Reliable with nothing to get out of order and cause trouble and delay

Steam may be either exhaust, high or low pressure live steam

Operating cost is next to nothing no difference how long in use

Noted for supplying **Hot Water** for domestic or industrial purposes



The Patterson System of Water Heating for any Service

Patterson-Kelly Co.
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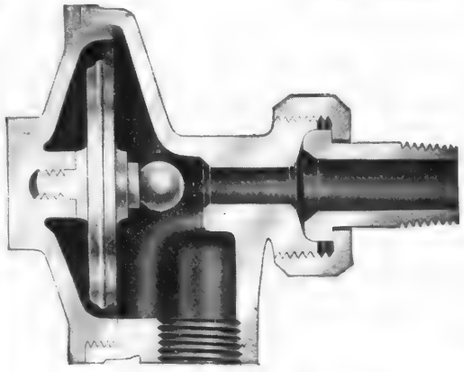
VACUUM **VAPOR**

Have been successfully installed in thousands of buildings—
A RECORD OF 20 YEARS OF SUCCESS



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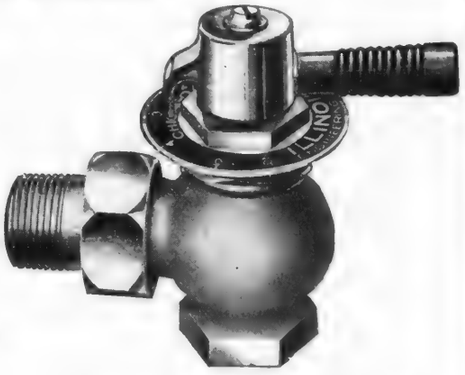
THESE
ILLINOIS VALVES
whenever you want the best

Write for New Vapor Catalog—real data



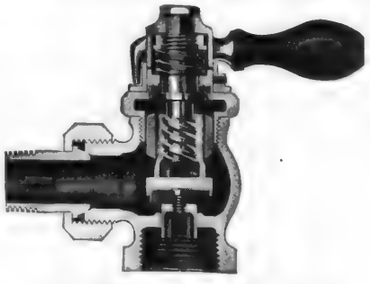
THERMO RADIATOR TRAP
The Original Vertical Seat Trap.
Dirt proof. Closes against the steam.
Positive operation and long life.

ILLINOIS MODULATING VALVE
A half turn from full open to closed.
All working parts accurately machined.
Easiest operating valve on market.

"Illinois Heating Systems make warm friends"

ILLINOIS · ENGINEERING · COMPANY

Racine Ave. and 20th Place, CHICAGO
Representatives in 21 principal cities **Consult local telephone directory**



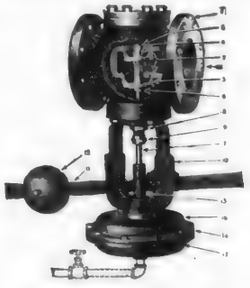
McAlear Packless Graduated Valve, not only the handsomest graduating valve but the simplest and of the best construction of any valve on the market.

The Experience of Over a Quarter of a Century is Behind

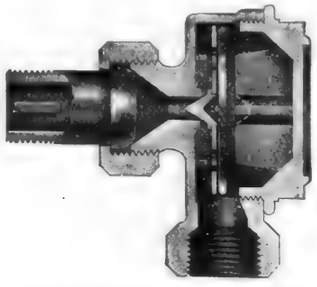
·McALEAR·

Vacuum, Vapor, Low and High Pressure

Heating Specialties



Acme Vacuum—Vapor Pressure Regulating Valve
Full Area—Accessible



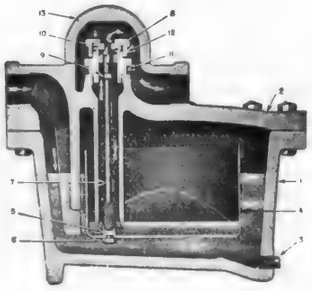
McAlear Perfection Radiator Trap will close tight against a steam pressure of 15 lbs. when discharging direct to the atmosphere, or into a vacuum of from 1 to 25 in.

Recognized the world over as STANDARD

We manufacture and carry in stock a complete line of Steam, Water and Air Specialties for Steam Heating and Power Plants.

Our catalogue No. 25 is ready for you

Our new bulletins A, B, C, D, E—covering McAlear Heating Specialties—are yours for the asking.



Universal Steam Trap
Reversible Seat—Accessible

THE McALEAR MFG. CO., 1901-7 So. Western Ave., Chicago
Telephone Canal 7201-7202

The Heating and Ventilating Magazine

VOL. XVIII. NO. 6

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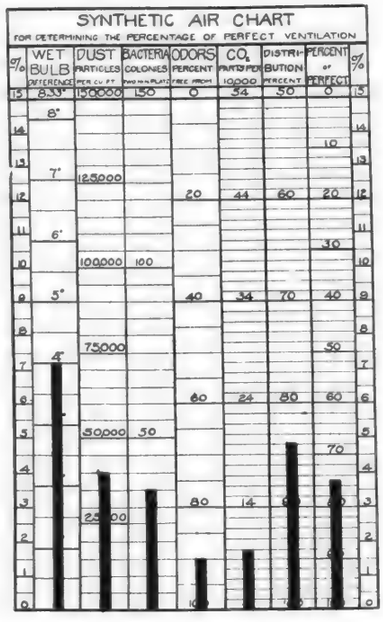
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BACTERIA COLONIES PER MM. PLATE FREE FROM
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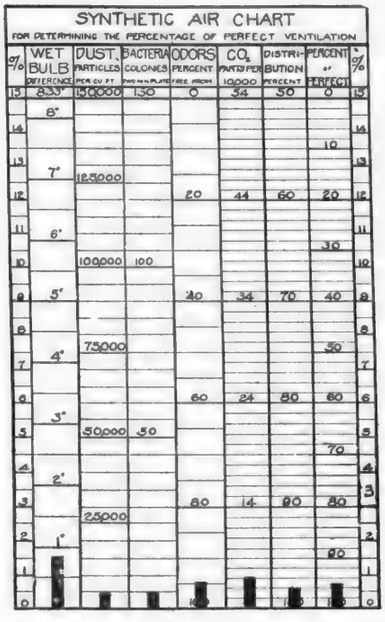
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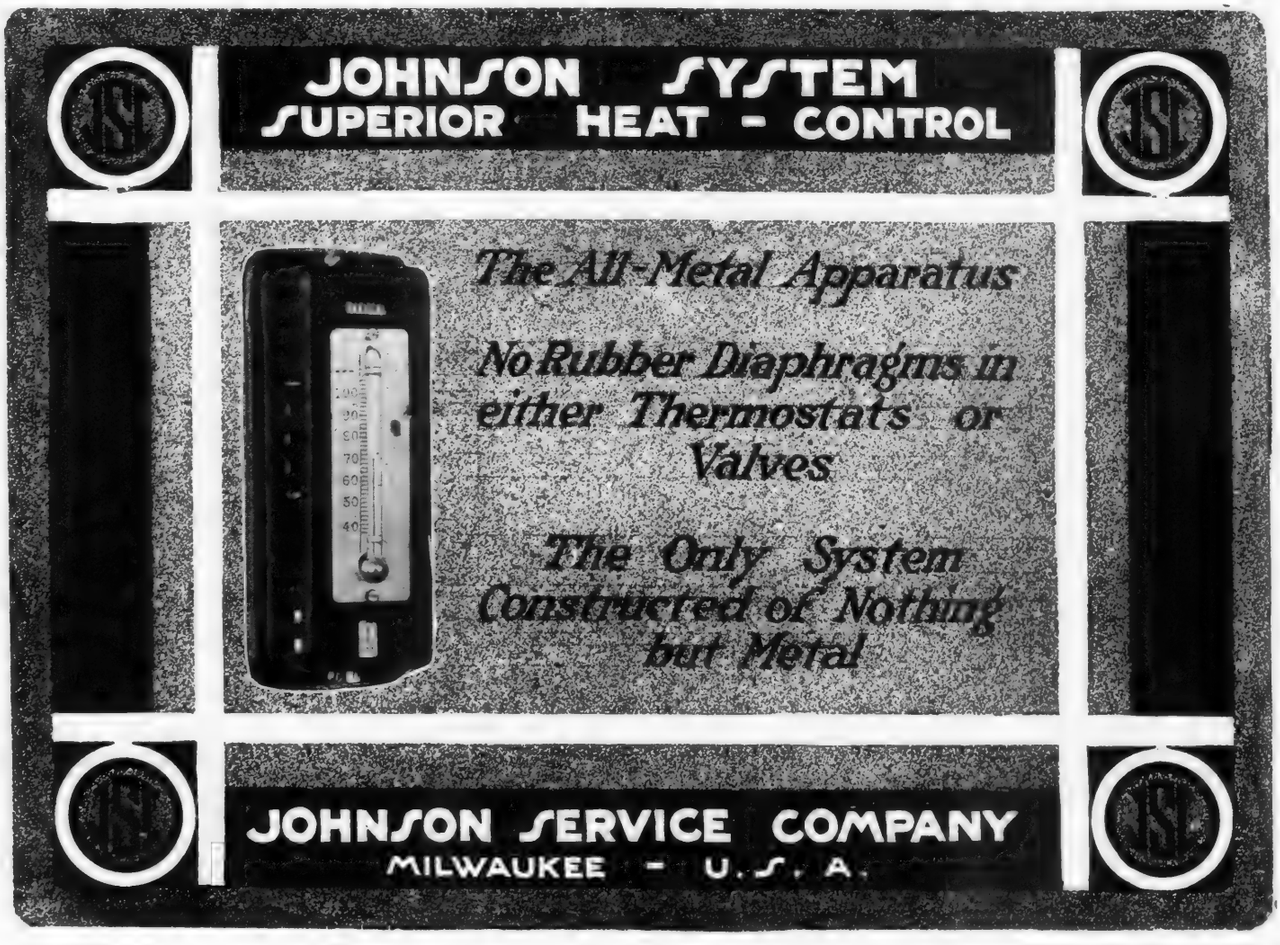
Test of a well ventilated factory. Chart shows a final percentage of 95.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JUNE, 1921

HOW FAR TO GO IN RECIRCULATING AIR

Data Showing Where Needed Savings Can Be Made in Reducing Superfluous Ventilation

BY CHARLES L. HUBBARD.

SUPPOSE, in a large manufacturing establishment the owners had adopted the practice of furnishing a midday meal for their employees for a nominal sum, based upon the cost of food actually consumed, plus a small margin of profit. Let us assume, for purposes of illustration that in order to simplify matters and reduce the cost of service, the food was placed upon the belt of a mechanical conveyor passing through the serving room, and from this each person took a sufficient amount to supply his own needs, while any food remaining upon the conveyor at the end of its run was dumped into an incinerator or disposed of in some similar manner.

With an arrangement of this kind it is safe to say that if the management saw 25% to 50% of the food placed on the conveyor going to waste, very little time would elapse before the supply would be cut down to a point where it exceeded the requirements by only a slight margin.

Now a condition similar to the foregoing is constantly taking place in many large manufacturing plants without discovery, simply because the waste is not visible, as in the case just described. This condition is excessive ventilation, resulting in a continuous stream of pure, warm air passing outboard to the atmosphere, while fuel is being constantly fed into the heaters in large quantities to replace this waste.

There is no doubt that the number of under-ventilated industrial buildings throughout the country greatly exceeds those which are over ventilated, and, furthermore, lack of proper ventilation is harmful, while too much fresh air is harmless, except for the cost of fuel required to produce it. However, fan blast heating systems have been installed extensively in new buildings during recent years and there has been a more or less general impression that if a certain amount of fresh air is desirable, an abundance must be better and no doubt many systems have been installed and operated in accordance with this idea.

WHEN OVER-VENTILATION IS OF SLIGHT IMPORTANCE.

When there is an excess of exhaust steam which would otherwise go to waste, over-ventilation is of slight importance, and also, in the past, when the cost of fuel was only a fraction of that at the present time, it was not necessary to gauge so carefully the volume of fresh air supplied to that actually required by the operatives.

POSSIBILITIES OF SAVING FUEL THROUGH RECIRCULATION.

The purpose of the present article is to bring to the attention of heating and ventilating engineers and, through them, the attention of plant managers, to the possibilities of saving fuel through recirculation, as a general proposition, and to show how the saving may be approximated in a given plant. Suggestions will also be included for such changes as are usually necessary, either in operation or installation, to bring about the desired results.

The first step is to impress upon the plant owner or manager the amount of fuel wasted from over-ventilation, in cases where the system is operating under conditions which are considered standard practice, both as regards comfort of the operatives and economy of operation. In order to bring this out more clearly, let us make a few calculations in connection with two or three different types of buildings in which warm air is used for heating.

CONDITIONS IN A MEDIUM SIZED DWELLING.

Take, for example, a medium-size dwelling heated with a warm-air furnace. An average 8-room building of this type, of wooden construction, will have an estimated heat loss by leakage and transmission of about 100,000 B. T. U. per hour in zero weather. In the best modern practice of warm-air furnace heating, this will be warmed by introducing fresh outside air at a maximum temperature of about 130° F. in the coldest weather. The heat delivered to a building by a furnace may be considered as being made up of two parts, that required to raise the temperature of the outside air to 70°, the normal temperature of the room, and an additional amount sufficient to replace that lost by leakage and transmission.

If the air is delivered at a temperature of 130° when it is zero outside, then 70/130 of the heat given to the entering air may be considered as making up the first part mentioned above, leaving 60/130 available for purely warming purposes. From this it is evident that the total heat supplied to the entering air must be equal to $1 \div 60/130 = 2.1$ times that lost by leakage and transmission.

Applying this to the case under consideration, we have a total of $100{,}000 \times 2.1 = 210{,}000$ B. T. U. per hour to be supplied by the furnace under maximum conditions, of which 110,000 B. T. U. are required for warming the outside air to the temperature of the room (ventilation) and 100,000 B. T. U. for offsetting the effects of leakage and transmission (heating).

TEN TIMES A MUCH VENTILATION AS NECESSARY.

Let us next compute the air volume necessary to bring in

this quantity of heat and see how it compares with that actually required for good ventilation. Air entering at 130° and cooling to 70° gives out (130—70) ÷ 55 = 1.1 B. T. U. per cubic foot. Hence, to give out 100,000 B. T. U. will require 100,000/1.1 = 90,000 cu. ft. of air per hour, in round numbers. As the standard commonly accepted for good ventilation is 1800 cu. ft. per occupant per hour, we should have, in the present case, an air supply sufficient for 90,000/1800 = 50 people. The average number of occupants for a house of this size would probably not exceed five people, so that ten times as much ventilation is provided as is actually required.

AMOUNT OF COAL WASTED.

To go still further and find how much coal is wasted, let us assume a heating season of 220 days with an average outside temperature of 35° F., which is commonly taken for conditions in New England and similar locations. If 110,000 B. T. U. are required with a difference of 70° between the inside and outside temperature, then only one-half that, or 55,000 B. T. U. will be required for a difference of 35°.

If we assume the house to be heated to 70° during 15 hours each day, then the heat units required per season for ventilation will be 15 × 220 × 55,000 = 181,500,000 B. T. U. Taking the thermal value of 1 lb. of coal as 13,000 B. T. U., and assuming an average furnace efficiency of 50%, it will require 181,500,000/(13,000 × 0.05) = 27,920 lbs. of coal, or practically 14 tons.

If the furnace, in this case, should be equipped with a return register, and the air be recirculated within the house, theoretically the above amount of coal would be saved annually, and, actually, an amount approaching this would be saved if it were customary to heat and ventilate the entire house for the period of time assumed. As regards the matter of ventilation, it is safe to assume one complete change of air per hour by leakage alone in the average well-built house which, in the present case, would amount to about 16,000 cu. ft. per hour, or enough for nine people on a basis of 188 cu. ft. each, which is more than enough for any family which would be likely to occupy a house of this size.

CONDITIONS IN A STEEL AND CONCRETE INDUSTRIAL BUILDING.

Let us next take the case of a steel and concrete industrial building having a section and dimensions as shown in Fig. 1, and a length of 100 ft. Assuming two-thirds of the gross wall area to be of glass, we have the following:

Wall area,	2000 sq. ft.
Glass area,	4000 sq. ft.
Roof area,	7000 sq. ft.
Floor area,	6000 sq. ft.

Transmission factors for an inside temperature of 70° are taken as follows, being the heat loss in B. T. U. per square foot of surface per hour when it is zero outside.

Wall, 8-in. concrete, ...	36 B. T. U.
Glass, single windows, ...	84 B. T. U.
Roof, slate on matched boards, ...	21 B. T. U.
Floor, cement, ...	6 B. T. U.

The factor for exposure and leakage is 1.3.

Using these factors gives a total heat loss from the building of 768,000 B. T. U. per hour in zero weather and 768,000 ÷ 2 = 384,150 B. T. U. per hour when it is 35°, which may be taken as the average outside temperature for a heating season of 200 working days.

If the air is admitted at a temperature of 140° and cooled to 70° (the normal temperature of the room) each cubic foot will bring in (140 — 70)/55 = 1.27 B. T. U., which may be utilized for warming the building. Therefore, it will be necessary to introduce 768,000 ÷ 1.27 = 605,000 cu. ft. of air per hour to supply this amount of heat with the usual working temperature range assumed above.

If 100 men were employed in the building, the normal air supply, as commonly provided, should be 1800 × 100 = 180,000 cu. ft. per hour, which leaves an excess of 605,000 — 180,000 = 425,000 cu. ft. per hour under actual working conditions. As this air must be raised from zero to 70° before it can be used for the transmission of heat for warming the building, it amounts to the waste of (425,000 × 70)/55 = 541,000 B. T. U. per hour.

For the heating season, with an average outside temperature of 35°, this will be 541,000 ÷ 2 = 270,500 B. T. U. per hour, or with an 8-hour working day, it will amount to a total of 270,500 × 8 × 200 = 432,800,000 B. T. U.

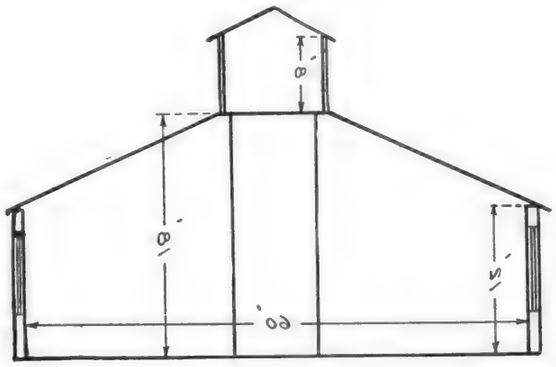


FIG. 1—CONDITIONS IN STEEL AND CONCRETE INDUSTRIAL BUILDNG.

With a boiler efficiency of 60% and a coal having a thermal value of 13,500 B. T. U. per pound, the waste, due to excess ventilation, will amount to 432,800,000/ (13,500 × 0.6) = 53,432 lbs., or 27 tons per heating season. This condition could be easily remedied by arranging the main dampers at the intake so as to draw in 180,000 cu. ft. of air per hour from the outside and take the remaining 425,000 cu. ft. from the inside of the building.

THE DIFFERENCES EXPRESSED IN PERCENTAGES.

As percentages are more useful for general application than the actual figures applying to a single building of definite size, let us reduce the above results to this form, so that they may be used for approximating the conditions to be found in larger plants of a similar type operated in the same general manner. The average quantity of heat required per hour for warming the building during the heating season (outside temperature 35° F.) was found to be 384,150 B. T. U. When taking the full quantity of air from outside at this temperature, the heat required for ventilation is (605,000 × 35)/55 = 385,000 B. T. U., making a total of 384,150 + 385,000 = 796,150 B. T. U.

We have found the waste due to excessive ventilation, with the same outside temperature, to be 270,500 B. T. U. per hour, which is 270,500/769,150 = 0.35, or 35% of the total heat expenditure under the assumed working conditions. Hence, by the simple change of recirculating a portion of the air and taking only that actually needed from outside, over a third of the fuel cost may be saved.

FURTHER REDUCTIONS POSSIBLE

Going into the matter still further, it may be possible to reduce the fuel expenditure even more than noted above without cutting down the ventilation below a good standard of purity for a building of this type. In most buildings, as previously stated, it is permissible to count on one air change per hour due to natural leakage and this has been provided for in making the computations for heat loss in the present case.

If, however, the building construction is too tight to allow this, sashes may be opened sufficiently to produce this result without affecting the action of the heating system.

The building under consideration has a contents of about 120,000 cu. ft., so that one air change per hour will furnish this amount of air, leaving only 180,000 — 120,000 = 60,000 cu. ft. per hour to be taken from the outside. This makes it possible to reduce the outside air supply from 605,000 to 60,000 cu. ft., which results in a saving of

$$\frac{(605{,}000 - 60{,}000) \times 35}{55} = 347{,}000 \text{ B. T. U. per hour, or}$$

347,000/769,150 = 0.45, or 45%.

Of course, the amount which this outside air supply may be cut down and recirculation within the building substituted will vary widely in different cases, depending upon local conditions. If the space is large per occupant, as in machine and erecting shops, wood-working shops, etc., it is usually

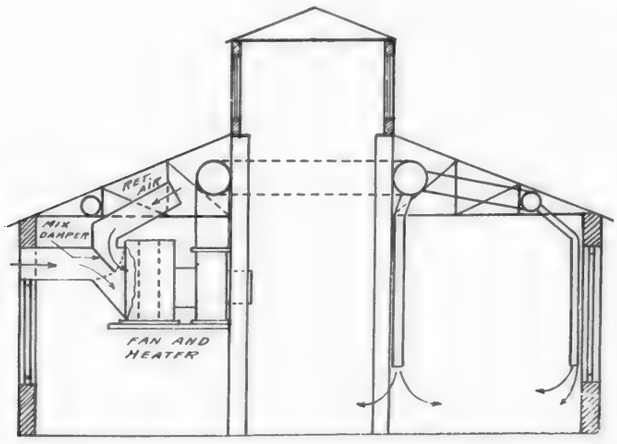


FIG. 2—CHANGES IN EQUIPMENT NECESSARY FOR RECIRCULATION.

possible to depend entirely upon natural leakage and recirculate the entire air volume necessary to transmit the heat. When the rooms become more crowded, as in fine machine work, shoe shops and textile mills, it is necessary to admit a larger proportion of outside air in order to maintain the desired standard of purity. The required amount of fresh air is easily determined by allowing one change per hour for leakage and taking in enough more from the outside to bring up the total to about 1800 cu. ft. per hour, per occupant.

LEAKAGE LESS WITH IRON SASH.

With iron sash the leakage per square foot of window area is considerably less than with the older type of wooden sash but, on the other hand, the exposed area is usually much greater in buildings of modern construction employing iron sash, so that the net result is much the same.

In buildings where there is a large amount of exhaust steam in proportion to the heating requirements, there will be no particular advantage in recirculating the air if the main heater has sufficient capacity to properly warm the building when taking the full amount of air from outside. On the other hand, in many industrial buildings, the power requirements are comparatively small in proportion to the heating and ventilating requirements, so that live steam must be used in varying amounts to supplement the exhaust steam. In buildings of this type, the live-steam drain on the boilers for heating purposes may often be eliminated or greatly reduced by a partial recirculation of air, thus bringing about a saving in fuel which is a net gain.

PLANTS USING CENTRAL STATION ELECTRIC POWER OFFER OPPORTUNITIES FOR VENTILATION ECONOMIES.

There are also many plants at the present time purchasing electric power from central stations and using live steam entirely for heating and ventilation. In this class of buildings

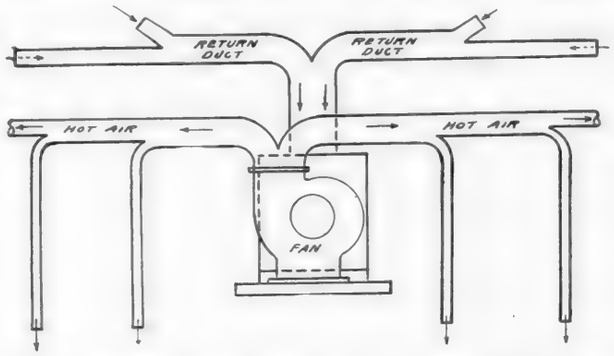


FIG 3—METHOD OF KEEPING WARM AIR NEAR FLOOR AND UTILIZING SPACE BENEATH MONITOR AS A RETURN AIRWAY.

there is frequently an opportunity to cut down fuel costs a substantial amount without interfering to any appreciable amount with the results actually obtained as regards the air quality of the rooms. There are, however, many buildings where the character of the processes carried on are such that no reduction in the outside air supply can well be made. This applies especially to rooms and departments having objectionable odors or fumes, lint, dust and those which are more or less crowded. In cases of this kind recirculation is often carried on to advantage by installing an air washer for purifying the air before it is returned to the building.

The recirculation of air is not a new idea and fan blast systems have been installed for many years with a by-pass arrangement for taking the air from either inside or outside of the building. For plants thus equipped the present article

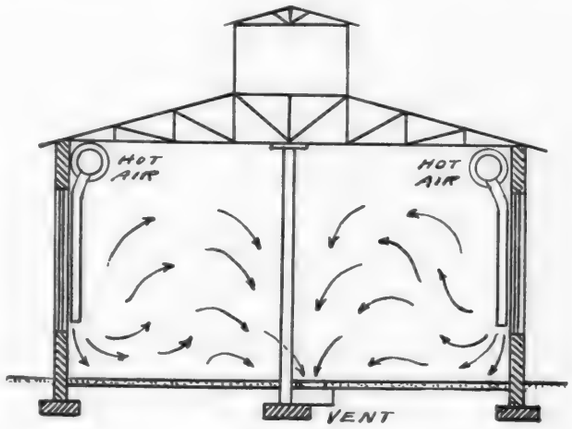


FIG. 4—ARRANGEMENT FOR AIR SUPPLY IN FOUNDRIES WHERE GASES HEAVIER THAN AIR ARE PRESENT.

simply suggests an investigation to determine if this is being taken advantage of to the fullest extent. When there is no provision for recirculation and calculations, as previously described, indicate a saving in fuel by this method, then the necessary ducts and dampers should be installed and made use of as circumstances require.

NEW FACTORS BEARING ON PROBLEM.

Interest in this method of operating a fan blast system has been more recently stimulated by two facts: first, the scarcity and high cost of fuel and, second, by exhaustive examinations along the line of ventilation which seem to

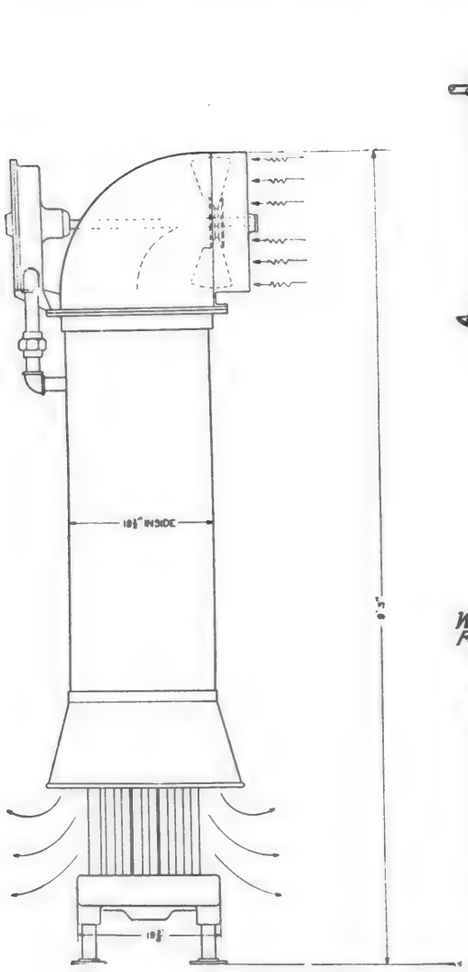
indicate that air movement, temperature regulation and humidity control are of greater importance than the volume taken in from outside. All three of these conditions are possible with recirculation and many plants are operating successfully with practically all of the air returned from the building, air washers being employed when dust and lint are present.

The changes in equipment necessary for recirculation, if not already provided, are usually simple, the general principle being illustrated in Fig. 2. This consists essentially in a connection between the outside inlet and the heater, with a mixing damper so arranged as to draw air either from outside or inside the building. By setting the damper in various intermediate positions the proportions of each may be varied at will. In order to avoid producing a strong local circulation in the vicinity of the fan and heater, it is well to carry up the inside connection so as to draw air from the upper part of the building. In this way the warm air is kept near the floor where most needed and the space beneath the monitor utilized as a return airway without the use of separate ducts. This effect is increased in some cases by carrying ducts away from the heater a short distance, as shown in Fig. 3, with two or three openings in each branch, if there is a tendency to strong draft near the inside inlet with a single opening. This arrangement is especially adapted to rooms of less height than shown in Fig. 2. With both of these methods of air return the warm air supply should be delivered near the floor and downward along the outer walls.

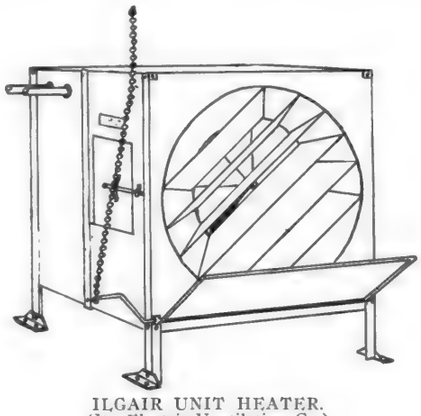
HOW THE UNIT HEATER IS FITTING INTO THE SITUATION.

A device coming into more general use for heating by the recirculation method is the unit heater, several forms of which are shown in Fig. 4. This consists of fan, heater and motor, combined in a single unit. No ducts are used, the return air being drawn into the fan at both ends and forced upward through the heater to the outlet at the top, which may be turned to discharge in any direction desired. Heaters of this general type are made in a variety of forms to suit all conditions and are used in buildings of all sizes by varying the number of units installed.

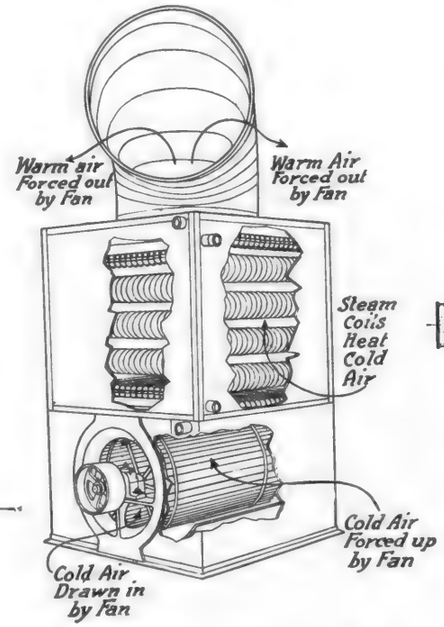
Buildings which require an abundance of fresh outside air and are not adapted to recirculation are those containing large quantities of steam, like paper mills, dye houses, foundries, etc. Here the vapor is disposed of by passing large volumes of air at a low relative humidity into the lower part of the room which in rising absorbs moisture up to nearly the point of saturation before being discharged. When steam only is pres-



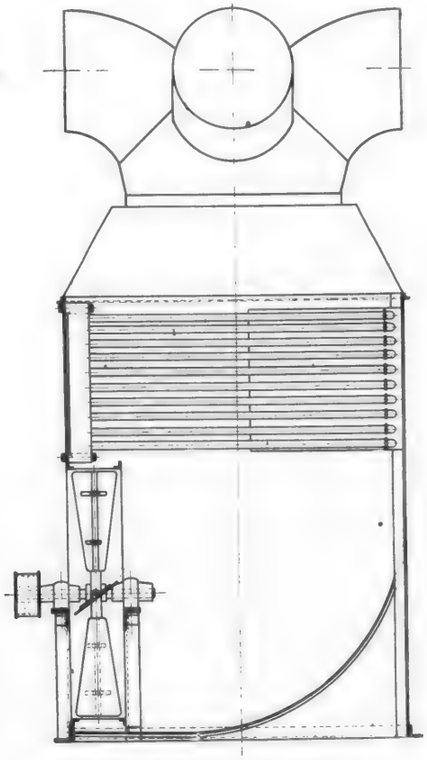
A. B. C. UNIT HEATER.
(American Blower Co.)



ILGAIR UNIT HEATER.
(Ilg Electric Ventilating Co.)


Warm air Forced out by Fan
Warm Air Forced out by Fan
Steam Coils Heat Cold Air
Cold Air Forced up by Fan
Cold Air Drawn in by Fan

SKINNER BROS. (BAETZ PATENT) UNIT HEATER.
(Skinner Bros. Mfg. Co.)



STURTEVANT UNIT HEATER.
(B. F. Sturtevant Co.)

TYPES OF UNIT HEATERS FOR WARMING LARGE VOLUMES OF AIR.

ent, the moist air is removed through roof or ceiling ventilators, but in foundaries, where gases heavier than air are also present, the discharge should be from the lower part of the room, as illustrated in Fig. 5.

It should be stated in this connection that the unit heater is successfully employed in many cases for the warming of foundaries. When used simply for air recirculation it acts by breaking up localized volumes of vapor and gas and tends to equalize the humidity by diffusion. If steam is present in large quantities, rather than gases, the heaters may be provided with outside air connections and the moist warm air forced out through the monitor windows or roof vents. This arrangement is especially adapted to mild weather conditions, as when it is extremely cold outside, air tends to enter the upper windows and condense the steam in the upper part of the building. When heavy gases are present, there should always be a discharge fan drawing from openings in or near the floor.

MECHANICAL EQUIPMENT OF THE NEW MANITOBA PARLIAMENT BUILDING

AS a piece of architecture in which elegance and dignity are linked to utility and sound construction enhanced by a comprehensive treatment of sculpture and painting, the new Manitoba Parliament Building, in Winnipeg, Manitoba, stands as a notable monument. This is the characterization of this building expressed by Professor A. A. Stoughton, of the University of Manitoba, in *Construction*. In plan the building assumes the shape of an H, the arms of the H extending east and west and containing the departments and working spaces. The middle bar of the letter is occupied by the great monumental rotunda which the dome surmounts, the entrance portico and vestibules and grand staircase leading up through this rotunda to the legislative chamber with all its dependencies, on the second story. The main public and ceremonial rooms are on this level, grouped in the central portion.

The mechanical equipment of the building was designed and supervised by S. S. Kennedy, consulting engineer, of Winnipeg, who described it as follows in the same number of *Construction*.

The steam supply is obtained from a central power house having five 250 H. P. water-tube boilers, automatic chain-grate stokers, induced draft equipment and economizer coils, which is part of a forced circulation water heating system for heating the Law Courts Building. The fuel is delivered into an overhead steel bunker by means of a bucket conveyor which also delivers the ashes to an overhead ash dump over the driveway.

A 6 ft. 9 in. x 6 ft. reinforced concrete tunnel connects the central power house with the Parliament Building (a distance of about 1100 ft.), with branch tunnels to Law Courts and Land Titles Buildings, and also to the group of University buildings.

An 8-in. pipe carrying steam at 100 lbs. pressure is run through a tunnel to the Parliament Building, and there reduced to 4 lbs. pressure for fan coil service, and to atmospheric pressure for direct heating.

Except for entrance vestibules and main stairhall, the building is heated by direct radiators placed under the windows, connected to steam supply and vacuum return on a two-pipe system. The steam supply to radiators is controlled and operated by valves and thermostats. The condensation from the radiators is discharged into the vacuum return by siphon traps. The condensation is all measured by condensation meters of the American District Steam Company type. The vacuum return piping is run through the tunnel to the vacuum pump in the power house, and is discharged through a receiver tank and boiler-feed pump to the boilers.

FAN BLAST HEATING FOR ENTRANCE VESTIBULES AND MAIN STAIR HALL.

A 30-000 C. F. M. fan and steam coils are placed in the basement for heating the entrance vestibules and main stair hall. The suction of this fan is connected to recirculation registers, in the main stair and central halls, also to the main pipe tunnel from the power house to an air shaft at roof level. During the heating season this fan is operated to pull sufficient air through the tunnel to utilize the heat radiated from the 8-in. high pressure steam line, which, except in the most severe weather, is sufficient to properly heat the vestibule and main stair hall.

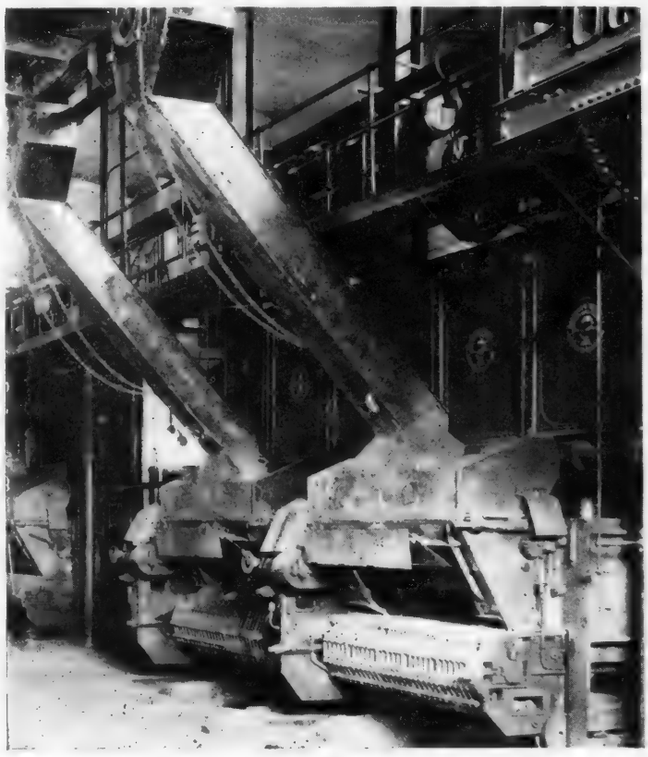
Approximately 35,000 sq. ft. of direct radiation is installed in the building.

VENTILATION.

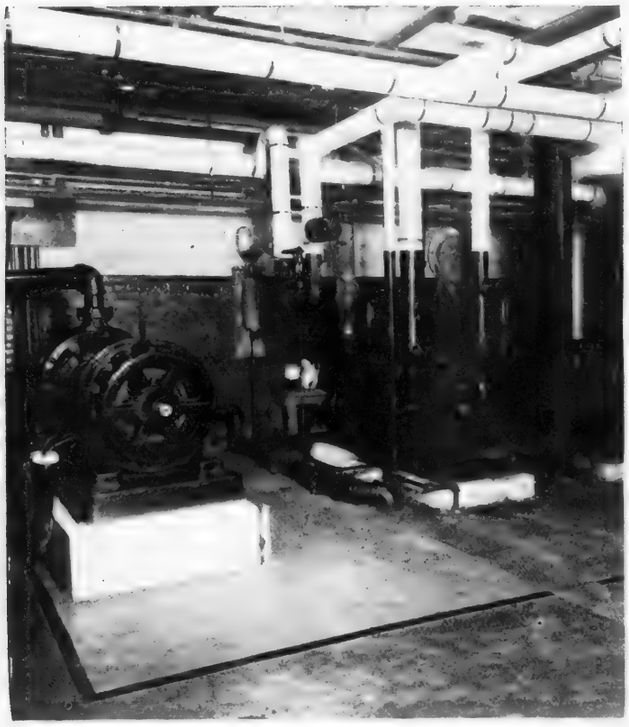
For ventilating the building six fans are used. Fans No. 1 and 2, each having a capacity of 45,000 cu. ft. of air per minute, supply fresh air to all offices, committee, library, reading and writing rooms, etc.

The fresh air for these fans is taken in through louvre opening at the ground level, and after being heated and washed, is discharged into large plenum tunnels in sub-basement, and from which galvanized-iron flues are run to rooms above and delivered into the rooms through lock-shield type registers 8 ft. above floor. Vent grilles are located just above base board and connected by galvanized-iron flues to attic space and allowed to escape through 42-in. copper ventilators.

Fan No. 3, having a capacity of 16,000 cu. ft. per minute, supplies fresh air to the legislative chamber. The air for this fan is taken in at the roof level, heated and washed, is delivered into the chamber through registers located behind the seats in both the main floor and gallery. Vent grilles are placed at the front



MECHANICAL STOKERS IN BOILER ROOM, MANITOBA PARLIAMENT BUILDING.



PUMP ROOM, MANITOBA PARLIAMENT BUILDING, SHOWING FIRE PUMP AND BOILER-FEED PUMP.

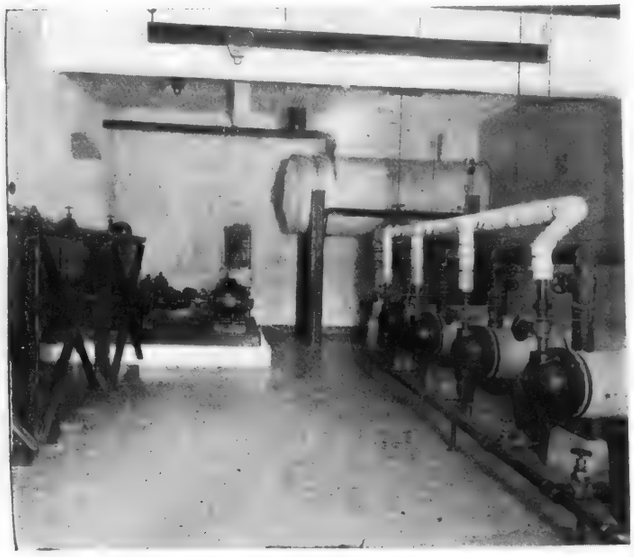
of the chamber, and also around the skylight, and connected to ventilators on roof.

Fan No. 4 is for heating and ventilating entrance vestibules and main stair hall.

Fan No. 5, having a capacity of 20,000 cu. ft. per minute, is located in the dome, and exhausts foul air from all toilet and locker rooms.

Fan No. 6 is a kitchen fan, and has a capacity of 7,000 cu. ft. per minute.

The fan coils are all of the regular Vento section, all set on the inlet side of the fans, and contain a total of 12,145 sq. ft. The steam supply to the coils is operated by temperature regulation valves and thermostats, which control the air entering the offices at any desired temperature between 60° and 80°. The return connections to the coils are provided with float-type traps.



DOMESTIC WATER HEATERS AND DRINKING WATER TANK AND PUMP, MANITOBA PARLIAMENT BUILDING.

The fresh air is all washed and humidified by mist-nozzle type air washers. During the summer time these washers have a cooling effect on the incoming air of 10° to 18° F.

The fan-coil casings and outer washer casings as well as the fresh air intakes, are constructed of asbestos lumber ½ in. thick, supported and bolted to 2 in. x 2½ in. x ⅜ in. tee iron frame.

The fans are all direct connected to 220 volt, D. C. variable speed motors.

VACUUM CLEANING.

Two vacuum cleaning machines are installed in basement, each having capacity for operating four cleaning tools, while maintaining a vacuum of 9 in. Vacuum cleaning piping, with outlets, is distributed throughout the building so that any point may be cleaned by attaching a 50-ft. hose to the nearest outlet. These vacuum cleaning machines are the reciprocating high-vacuum type, with dry and wet separators.

WATER SUPPLY.

The water supply is obtained from the city mains on Broadway. A 6-in. line is run into the power house, and from there is boosted by two centrifugal pumps through tunnel to two 10,000 gal. steel storage tanks in the dome of the Parliament Building. From

UNDERGROUND TUNNEL AND STEAM MAINS, MANITOBA PARLIAMENT BUILDING.

these tanks piping is installed to supply all requirements by gravity.

An underwriters' fire pump is installed in the power house, from which piping with 100 lbs. water pressure is run to the group of parliament buildings adjacent, and to 40 fire hose stations in the parliament building.

The domestic hot water is obtained from a water heating tank in power house and from four Patterson Booster heaters in Parliament Building. The circulation is effected by two small centrifugal pumps, installed on the circulation line in the power house.

For cooling water for drinking purposes, and for cooling kitchen refrigerator rooms, a 4½-ton direct-expansion refrigerator plant is installed in the basement. The drinking water system consists of a cork-insulated copper tank, with 100 lin. ft. of ammonia cooling coil in basement, two centrifugal pumps, an open copper tank in the dome, and circulation piping connection to 16 pedestal fountains in the corridors and 40 fountains and drinking faucets located in the office suites. The supply is all downward to the fountains, and a continuous circulation is obtained by connecting the supply risers back into the cooling tank. On these return connections are lock-shield valves, ad-

justed to permit a uniform circulation throughout the system. The operation of the pumps is automatically controlled by float switches at the tank in the dome.

Brass piping and fittings are used for hot water and drinking water and galvanized mild steel pipe for cold water.

The air-washer pumps and drinking water pump are of the horizontal split-casing volute type, and are direct connected to 220-volt D. C. motors.

INSULATION.

The fresh air intakes, between outside walls and the first bank of heating coils, are insulated with two layers of 1-in. cork board. Steam piping is covered with 85% magnesia, 2 in. thick on the high-pressure side and 1 in. thick on the low-pressure. Air-cell covering is on hot water piping, and wool felt is on cold water piping. The drinking water piping is insulated with cork, 2 in. thick.

AIR AS A CONVEYOR OF HEAT

With Notes on Principle Sources of Waste Incident to Such Use, and Methods of Reducing that Waste

BY S. HOMER WOODBRIDGE

(Concluded from May issue)

LET the normal heat loss through the walls and roof of a church auditorium be 1,500,000 B. T. U. per hour in zero weather. For the protection and maintenance of tone of a costly pipe organ or for the prevention of down drafts within the auditorium when occupied, or for the use of daily attendants seeking sanctuary benefits, it is desired to maintain an inside temperature of 65° throughout the eight months of the heating season. If the average temperature of that period is 35°, the corresponding rate of per hour heat loss from the building becomes 750,000 B. T. U. That thermal quantity may be conveyed to the auditorium by air from without passed through convectors, or by air from within rotated through the convectors. Let the average temperature of the air entering the church when the heating is effected by inflation, be 125°. The ratio of waste may be shown to be $\frac{65-35}{125-35} = 33\text{-}\frac{1}{3}\%$

The total coal for the closed season of 240 days, assuming the thermal value of the coal to be 13,750 B. T. U. per pound, and the firing and steaming efficiency to 62%, is found to be 253.32 tons, and the loss becomes 88.44 tons per year compared with the costs of effecting equal heating by rotation rather than inflation.

In the case of school buildings warmed solely by the convection method, whether by the gravitation or a mechanical propulsion of air, the fuel costs may be materially reduced by suitable provision for, and appropriate use of, a free and sure circulation of air by rotation at all times when ventilation is not called for. The convectors and the currents adapted to adequately warming a building in zero weather by the inflation process, may be made abundantly ample for maintaining needed temperature by the rotation process, by open doors between all rooms and hallways, by utilizing hall-ways and stairwells as downtake air passages, and so arranging basement rooms and doorways as to provide a free way for air flow to the cold air side of the aggregated or the segregated convectors. A school building, large or small, may be warmed day or night, outside of school hours when ventilation is not needed, at a cost varying from 30% to 40% less than by use of the inflation method for warming purposes during the same periods.

For the purpose of effecting such economy it has been the author's practice, whenever feasible, to warm school and similar buildings by the direct method independently of ventilation, and to provide for ventilation by wholly separate equipment, so avoiding the losses attending the inflation method for warming, and also the costs of operating fans outside of periods when ventilation is required. The practical objection to a general adoption of that plan is found in the perverse readiness of janitors, or operators, to make as effective an exhibition as possible of economy relative to the coal bin, without due regard to the paramount economy of physical health. That human failing may be generally circumvented by making it impossible to use the heating system alone without visible evidence of the suspension of ventilating work. As an example, let the heating of a school room be by a convector of 55 sq. ft. surface, so placed within a wall flue, 18 in. x 40 in., as to stand with bottom at or near the floor level, and before a 36 in. x 40 in. opening, and in such position that all air moving upward through the flue beneath it shall pass through the heater with a velocity equal to that existing in the air within the free flue below the heater. The warmed air issues into the room through an aperture 24 in x 30 in. some 6 ft. above the heater. The lower opening is provided with register dampers for tight closing when the fan is in action, and for opening when warming is to be without ventilation. All such dampers may be pneumatically operated from the master's, or the janitor's room. A glance at the dampers gives proof of the presence or absence of ventilation.

The method of rotation is frequently applied to small units of furnace, steam or water gravity heating with varying degrees of success or failure, dependent on the qualifications of the designer and operator of the system. The flow through convectors by rotation is generally at a much lower rate than by inflation. The thermal output of convectors is greatly affected by the rate of air flow through them. In the case of inflation, air flow through provided air ways is caused, first, by the relative expansion between the heated air within the vertical flues and the corresponding columns of cold air outside the building; second, by the chimney action of the building as a whole, tending to produce updraft through such flues though unheated.

When inflation is changed to rotation, the only motile force is that due to the difference in expansion between the heated air within the flues and that within, rather than that without, the house; and the chimney effect of the house becomes wholly inoperative. Hence the relative feebleness of the action of rotation, as compared with that of inflation, and the too often ignored necessity of providing means commensurate with that feebleness in order to insure successful rotation effects.

In the case of open residences housing one occupant for each 5000 cu. ft. or more of space contents, and for each 500 sq. ft. or more of enclosing wall surface, spontaneous ventilation,—that molecular movement through walls, and of mass movement through minute and larger crevices,—so meets all ordinary hygienic requirements during "closed season" weathers, as to make warming either by the radiation or rotation methods unobjectionable.

A dwelling three stories high, is heated by a "hot air" furnace, with four air ways to each floor, 10 in. in diameter to the first floor, 9 in. to the second, and 8 in. to the third, a total area of cross section of 5.24 sq. ft. The cold air box, if short and direct, is not less than 4 ft, cross section, and the velocity of air flow through it in still zero weather, may be 375 ft, per minute, a total cubic quantity of 90,000 ft. per hour, which the heat yielded from the furnace may raise from 0° to 140°, the inside

temperature being 70°, and the thermal yield to the house being 139,270 B. T. U. per hour.

Let the process of inflation be changed to rotation. If all the rooms of the house are to be thus heated through wide-open flue-ways for air travel, it must first of all be observed that the chimney effect of the warmed house, which, in the case of inflation, tended to intensify and equalize the rate of air flow through the twelve air ways, is now wanting, and that the three groups of flues have now weakened draft power, and of far greater inequality, than when active under inflation. If, under such conditions, heated air is to be passed in needed quantity to the first floor through this weakened flue action, it becomes necessary to make the way for the approach of air to the furnace, and for the passage of air through the heating chambers of the furnace, so large and free that the aspirating effect of the longer and stronger flues shall not retard or, worse still, reverse the flow through those shortest and weakest of the flues. The downtake for the passing of air from the first-floor level to the base of the furnace should therefore be made of such cross section that the total air quantity to be passed through the furnace for all three floors can be moved through them by a pressure produced by the difference in the weights of two equal columns of air, one in the cool air downtake and one in the heated air passage within and about the furnace.

Let the rate of coal burning be reduced to 67% of that required for heating by inflation, and let the volume of air passed to and through the furnace be such that the rise of temperature shall be from 60° to 160°. The per hour air volume is found to be $129\,270 \div (0.076 \times 100 \times 0.2375) = 71617$ cu. ft., or 19.89 cu. ft. per second. The per second velocity of flow through the downtake to, and of upflow through, the furnace may be computed as $\frac{1}{3} \times 4/11 \times \sqrt{5 \times 100} = 2.715$ ft. ($\frac{1}{3}$ being the estimated frictional co-efficient, 4/11 the approximate equivalent of $\frac{64.4}{459.4}$, and 5 being the assumed effective height of the operating heated and unheated air columns).

Under the assumed conditions, the area of the free way to the base of, and within, the furnace should be $19.89 \div 2.715 = 7.33$ sq. ft. A rule-of-thumb furnace man, or a trade "engineer," might be expected to advise an 18-in. or 20-in. downtake as reasonably sufficient, and a 24-in. downtake as abundantly ample, whereas a 36-in. is the least to be considered, and that without fret work in register faces, etc., if the conditions named are to be satisfied.

Among the many advantageous applications of the rotating method of heating by air as a vehicle are the adaptations to such large enclosures as the great sheds housing extensive manufacturing equipments, ship building establishments, piers and docking facilities, the floors of which are so actively crowded, and so walled, as to make a use of adequate direct radiation impracticable. The upper spaces in such structures provide ample room for sufficiently large and compact heaters and fans, and for distributing hot air mains, and supporting columns afford numerous places and needed protection for all required downtakes for air flow to floors.

A ship yard shed 600 ft. long and 300 ft. wide, provided with brick walls 18-in thick and 40 ft. high and one-half glass, the shed having a reinforced concrete roof 4 in. thick, also one-half glass, is to be warmed by the rotation method in—10° weather to a temperature of 50°, allowing for a change of air once each hour. Downtakes are to be allowed to each 6000 sq. ft. of floor area, and the maximum temperature of air in down-flow pipes is to be 140°, and the velocity of down flowing air within the pipes 1800 ft. per minute. The size of the downtakes may be found by computation as follows:

The computed total maximum heat requirement 19,700,000 B. T. U. per hour. Number of downtakes 30. Thermal units per downtake 656,666 B. T. U. per hour. Rise in temperature in debouching air above that of floor air 90°. Cubic feet of air per downtake per minute, $656{,}666 \div \frac{90 \times 60}{55} = 6640$, approximately. Pipe size in square feet, $6{,}640 \div 1800 = 3.72$.

In this manner the great upper floor of the new Commonwealth Pier, Boston, is warmed, as are also certain of the great sheds of the ship yards at Camden, N. J., and doubtless scores of other like structures. In the case of the Commonwealth Pier, the method of heating may be changed from partial to full inflation by a shifting of dampers to any degree desired, to exclude inside air from, and to admit outside air to, the grouped pair of combined fans and heaters which provide the air flow and heat required in all weathers and conditions of crowding on arrival of steamers with their heavy immigrant cargoes.

In both cases the entire equipment is aloft, unobstructing floors, and in position to take economic advantage of utilizing the upper strata of air at higher temperatures than floor air by bringing such air down to the floor. The entire heating and ventilating process is controlled from one point, the elevated platform supported on the super framing construction, and carrying the fans and heaters and the driving motors.

The heating is effected by one-sixth of the surface which would be required for equal work by direct radiation, and less than one-twentieth part of the piping and valving is used that would be called for by an equally effective direct heating system.

HOW HEATING AND VENTILATION IS TAUGHT AT PURDUE UNIVERSITY

BY R. W. NOLAND, M. E.

Professor of Heating and Ventilation.

II.

THE data sheets showing the various types of heating and ventilating systems are intended to convey to the mind of the student engineer a concrete conception as to how the well known types of systems operate. The sketches are practically self-explanatory and the student readily grasps the principles involved and, since they are grouped, naturally begins comparing one type of system with another. In working up these sketches, considerable care has been taken to avoid giving wrong impressions, by showing all equipment and connections as correctly as is possible in this type of diagram. Some of our best writers of technical books have a habit of accompanying excellent written matter with poorly executed sketches and in a way it is one object of these data sheets to attempt to do justice to the sketch side of the proposition. In the writer's experience it has often been found that one well executed sketch or diagram conveyed ideas that literally chapters of written matter would not make clear.

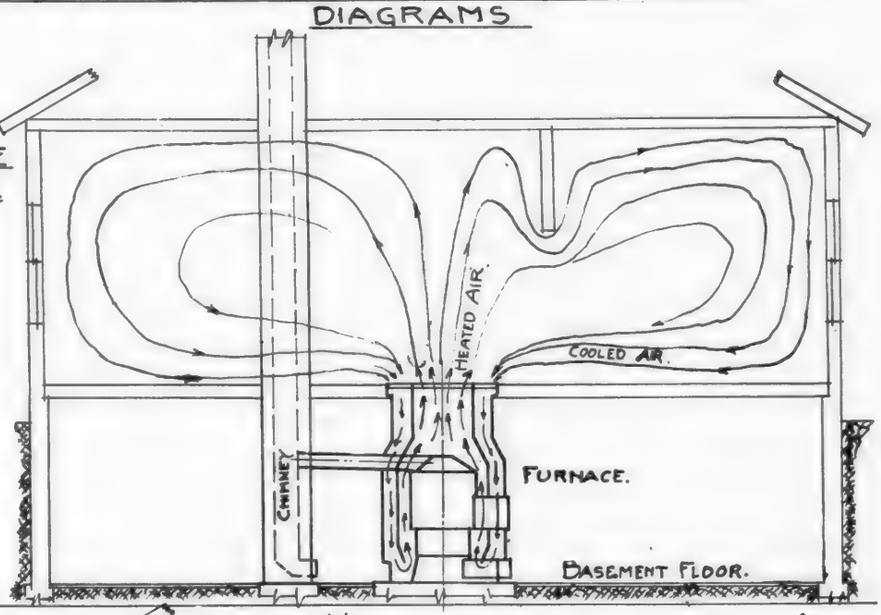
The sheet showing typical methods of returning condensation to boilers in steam heating systems is intended to supplement the sheets showing diagrams of steam heating systems.

The data sheet forms, numbered 1, 2 and 3 respectively, are to be used in connection with actual design work. At present these sheets are mimeographed and given out to the student in the drafting room. While these forms are no doubt imperfect they have been used by the writer in connection with actual heating and ventilating work for some time.

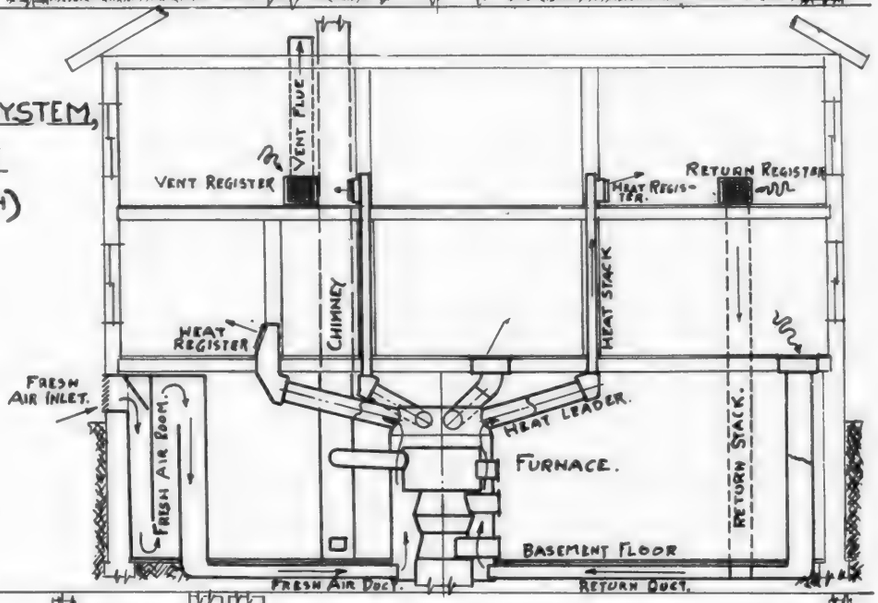
HOT AIR FURNACE HEATING SYSTEMS

DIAGRAMS

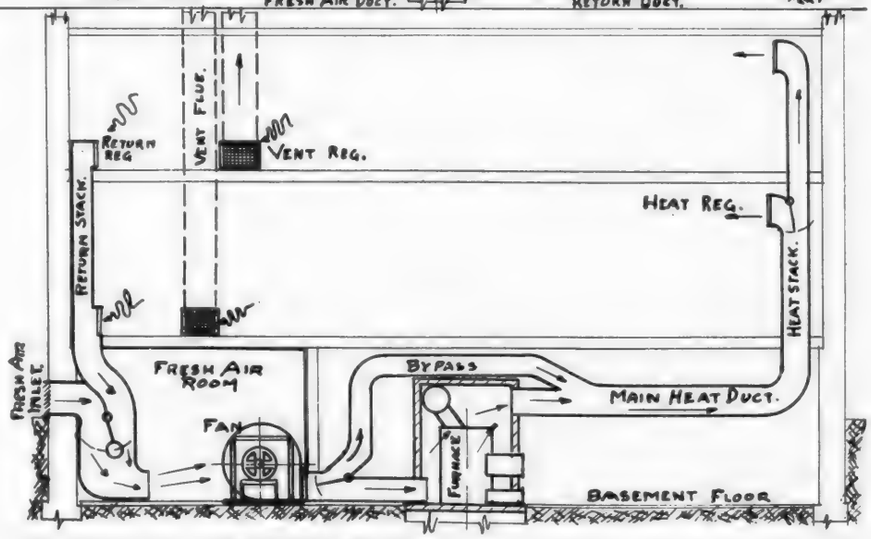
PIPELESS-FURNACE SYSTEM, GRAVITY. (ELEVATION)



PIPE FURNACE SYSTEM, GRAVITY (ELEVATION)



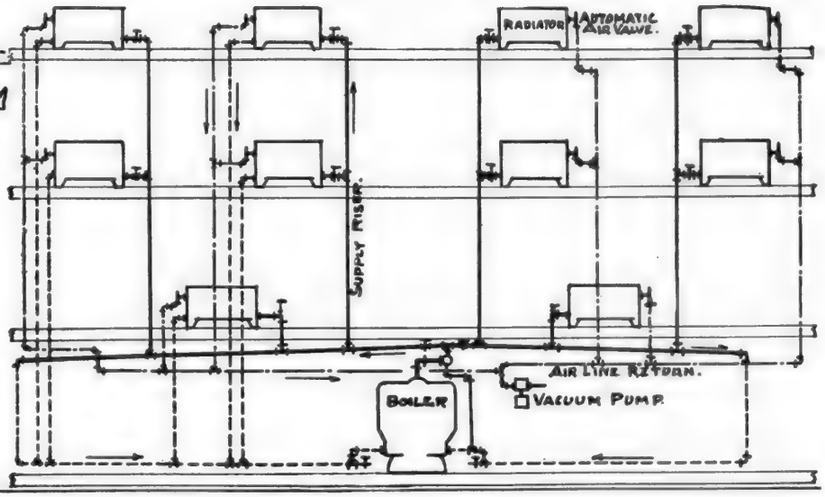
FAN FURNACE SYSTEM (ELEVATION)



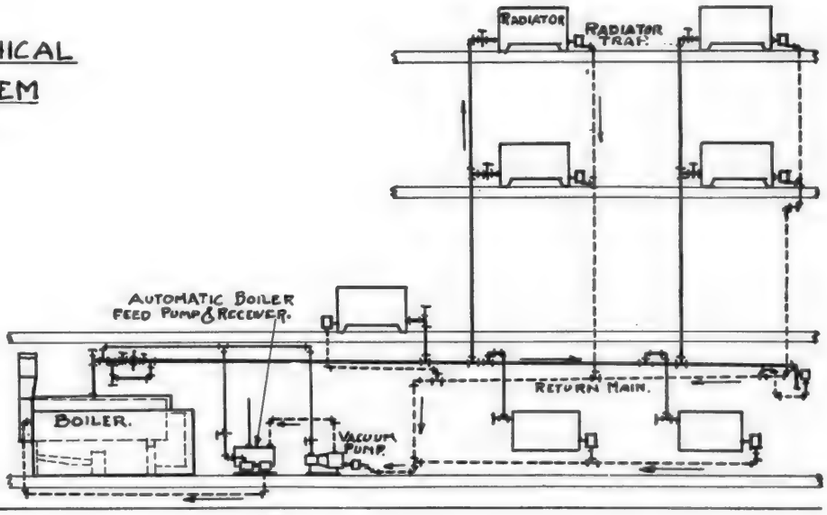
— STEAM HEATING SYSTEMS —

MECHANICAL VACUUM SYSTEMS AND VAPOR SYSTEM DIAGRAMS

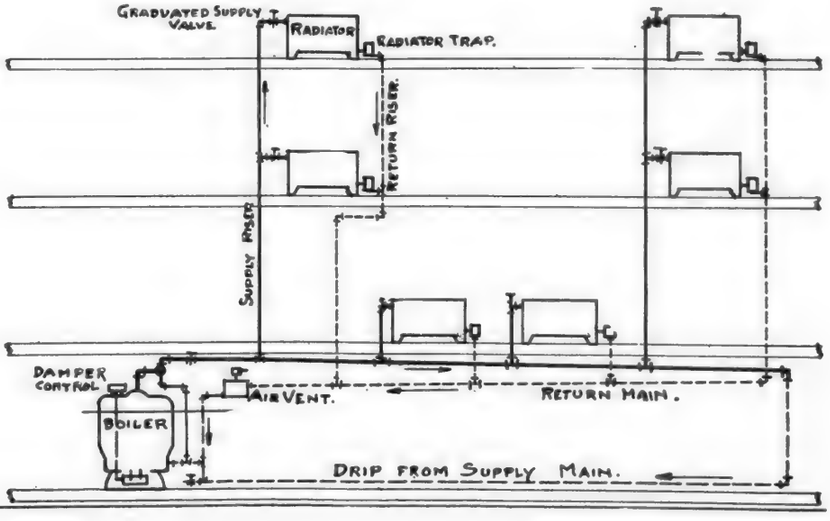
AIR LINE MECHANICAL VACUUM SYSTEM (ELEVATION)



TWO PIPE MECHANICAL VACUUM SYSTEM (ELEVATION)



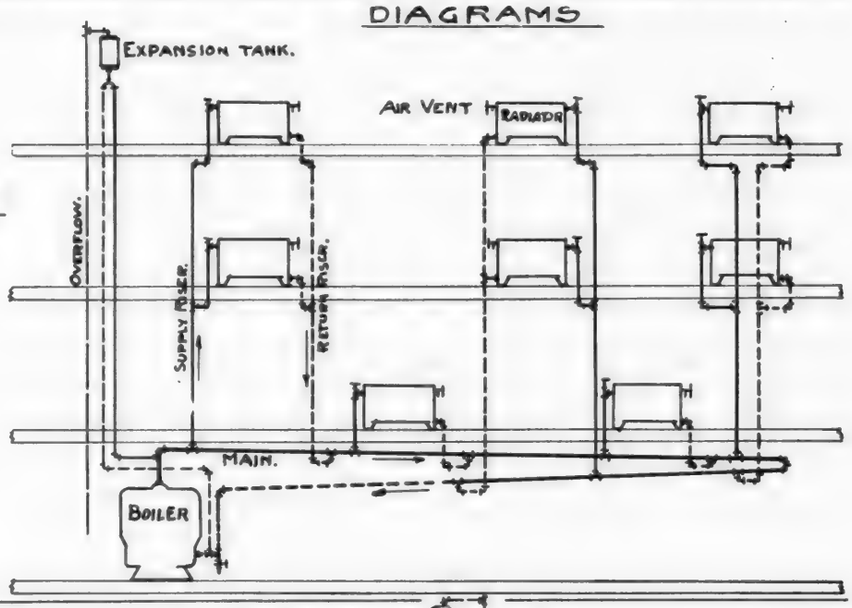
TYPICAL VAPOR SYSTEM (ELEVATION)



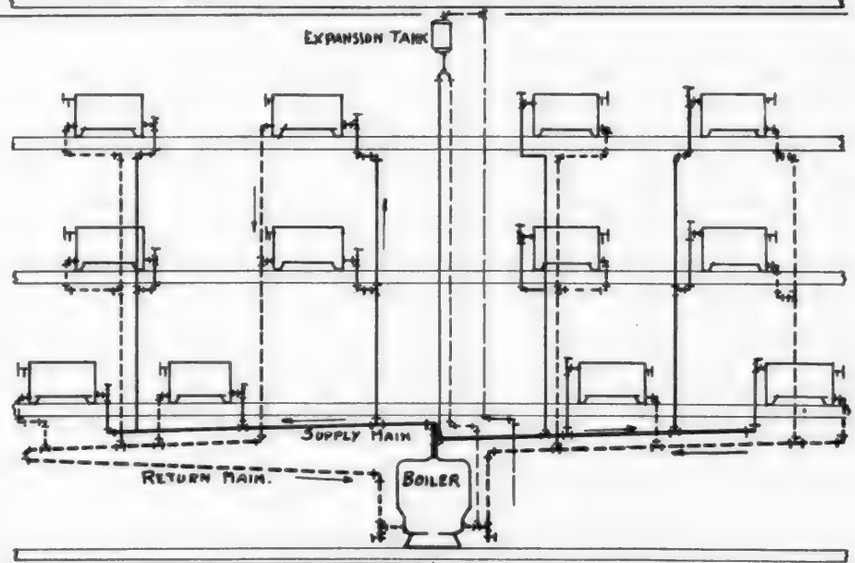
—GRAVITY HOT WATER HEATING SYSTEMS—

DIAGRAMS

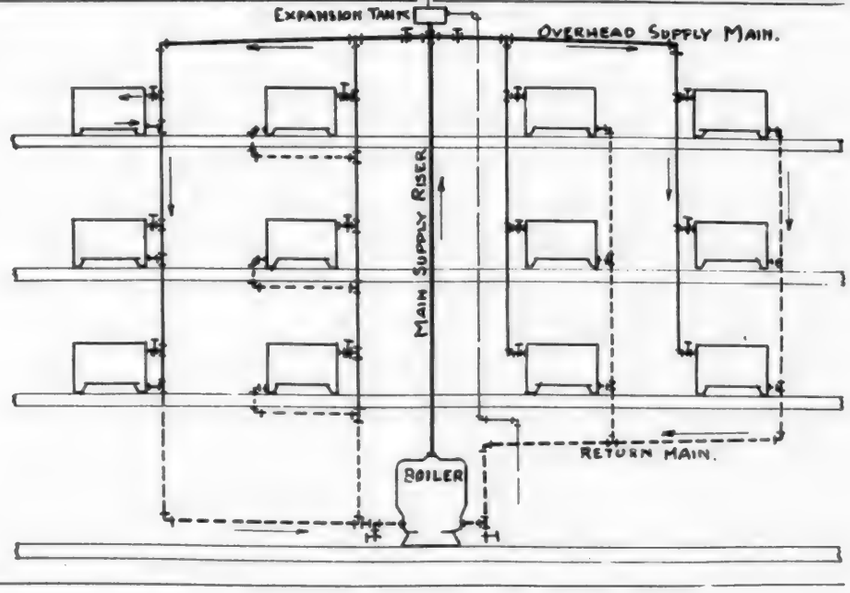
ONE PIPE OR SHUNT SYSTEM
(ELEVATION)



TWO PIPE SYSTEM
(ELEVATION)

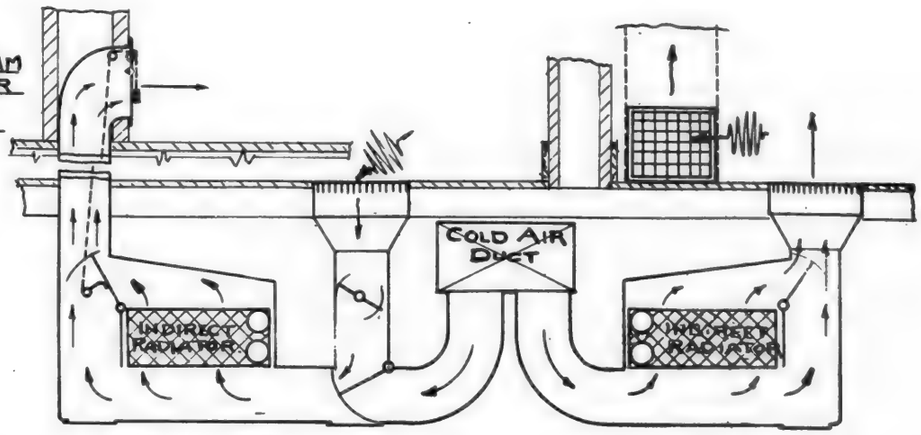


DOWN FEED SYSTEM
(ELEVATION)

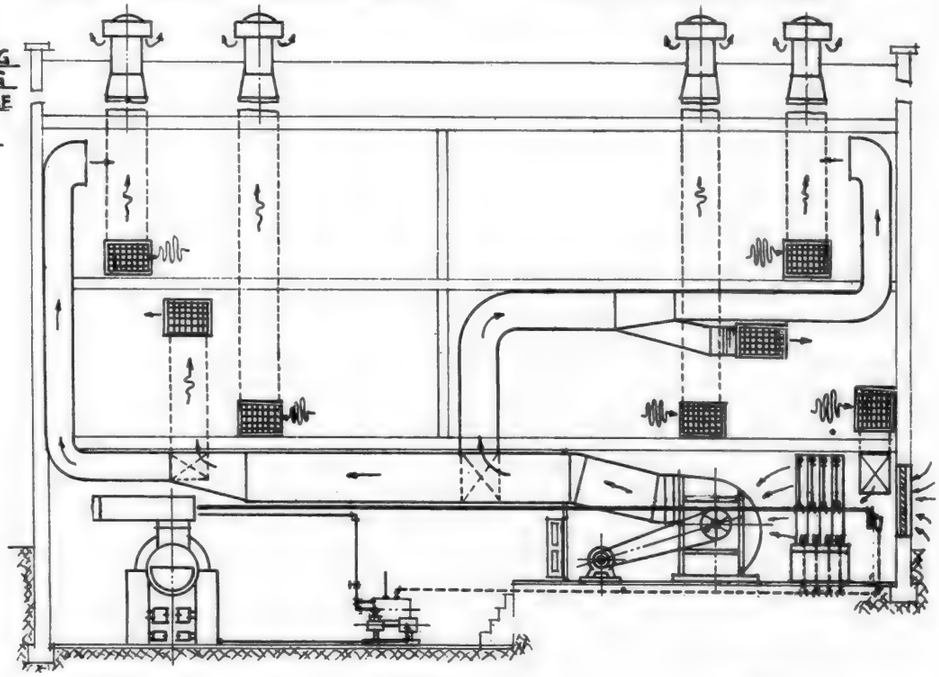


—INDIRECT HEATING AND VENTILATION.—

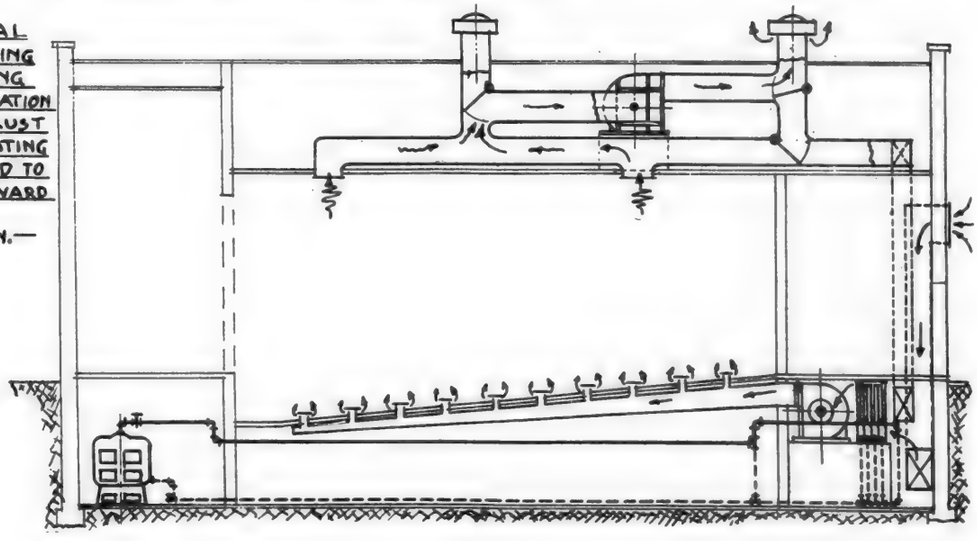
GRAVITY INDIRECT STEAM OR HOT WATER SYSTEM.
—ELEVATION.—



MECHANICAL INDIRECT HEATING AND VENTILATING SYSTEM, PRESSURE TYPE.
—ELEVATION.—



MECHANICAL INDIRECT HEATING AND VENTILATING SYSTEM, COMBINATION PRESSURE, EXHAUST AND RECIRCULATING SYSTEM APPLIED TO A THEATRE. UPWARD VENTILATION.
—ELEVATION.—



INSTRUCTION COURSE FOR CUSTODIANS AND JANITORS

Lesson No. VI—Heat Regulation

By EDWIN S. HALLETT,
Chief Engineer, St. Louis Board of Education.

HEAT regulation in school buildings is a positive necessity. Manual labor may be performed in a fair manner without a close control of the heat, because physical exercise permits a body control sufficient for comfort but not so with mental work and still less where the exercise is for mental development. It is essential that bodily discomfort shall not divide the attention of the child with study exercises.

The engineer must recognize the above reason for installing the heat regulating system but he has another very valid reason. That is the economy in the use of fuel in the operation of the building. The number of complaints of heating apparatus due to faulty regulation is nearly 100%. Many engineers seem to give great consideration to the design of the heating plant and treat the regulation as of minor importance. This is a great mistake.

A small economy in the first cost will generally result in expensive overhauling or, what is quite common, the abandonment of the whole regulating system. Many plants have also been abandoned because the custodian could not keep it in operation without more trouble and expense than he could give. It is with a view of supplying the instructon for such maintenance that these lessons are prepared.

UNDERSTANDING THE LAYOUT

The regulation for schools consists of an air pump for supplying compressed air for power to operate the heating apparatus; a system of air pipes from the air reservoir extending to every room and to all heating apparatus under control; a thermostat, the sensitive instrument for measuring the temperature in the room and actuating a delicate valve in the air pipe leading to the heating apparatus for that room; and finally the air-operated motor or steam valve, as the case may be, which effects the control.

The pump, the piping system, the thermostat, and the air motor constitute the four important elements for detailed study. The air pump must be automatic in its action and maintain about 15 lbs. per square inch of pressure. There are three types of pumps in common use: the steam driven, the hydraulic and the electric. Low-pressure systems where steam pressure is not uniformly above 10 lbs. must use the water power or electric. Where steam is available at about 15 lbs. it is the most suitable pump. The control is by a diaphragm valve on the steam line operated by the air pressure. It is usually a Marsh type of single-acting pump and must be handled with considerable care. The valve sometimes sticks. Use a high grade of steam cylinder oil in very small quantities. The steam cylinder must be large enough to give ample air pressure. The packing on the rod must be a perfect fit and set up not too tight. It must be kept lubricated. The auxiliary steam valve must often be pushed off center to start.

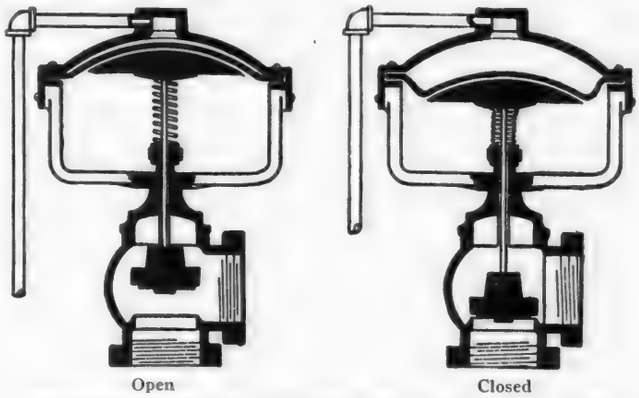
TROUBLES OF WATER-POWER PUMPS.

The water power pump has had a very large run because water pressure is always at hand. Usually the water used costs more than either steam or electricity. The ailments of these pumps are many. The cup leathers leak and the new ones are often too tight. The trippers break or bend and wear out. The plunger packing must be skillfully adjusted. If the pump stops all heat is turned on full and this is the most common complaint.

The electric pump is geared or belted to a small motor with a starting switch operated by air pressure. If a rubber diaphragm is used it will occasionally puncture and a new one must be installed by taking off the metal cap and replacing a diaphragm, preferably secured from the manufacturers of the system. A screw adjustment of the spring regulates the pressure. Alternating current does not require a starting rheostat but direct-current motors generally do. The custodian must learn to handle and repair these pumps. The intake for the air cylinder must be piped to the outside or to some place where clean dry air can be secured. It is important to keep both dust and moisture out of the air lines. Where screens and filters are used they must be kept clean.

PIPING SYSTEM.

The piping system is made of galvanized-iron varying in size from ¾ in. to ⅛ in., run concealed. It is the most difficult job of pipe work in the school. The ends must all be reamed and carefully threaded. Make sure there is no dirt in the pipe.



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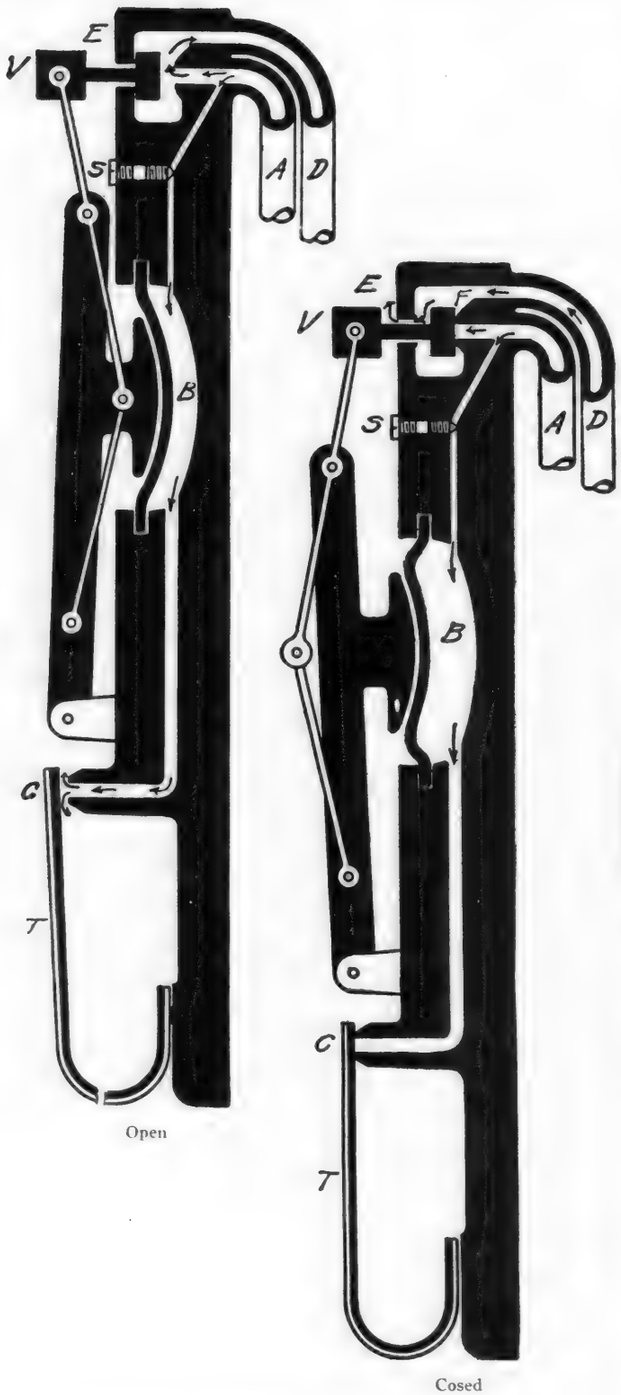
SECTIONS THROUGH DIAPHRAGM RADIATOR VALVES.

Keep the red lead and dope out of the pipe and fittings. Grade the pipe back to the pump if possible. Where not convenient, put in a drip and drain, otherwise they will fill with condensation of moisture. If pipe runs through cinder concrete floor filling it will not last long. Small pipe is harder to make tight than large.

CONSTRUCTION OF THERMOSTAT.

The thermostat is that mysterious instrument which has the human faculty of feeling the temperature. There are two kinds of sensitive elements; the metal strip made up of two kinds of metal having different rates of expansion per degree of temperature. These strips are welded or riveted together so that a change of temperature causes the combined strip to bend. The thermostat operates by the strip bending and uncovering a small air port which actuates a valve in the air line to the radiator or damper. An adjustment screw sets the strip to lift at any predetermined temperature. Another style of thermostat uses a composition of hard rubber which has the quality of expanding with heat and by the use of levers uncovers the air port as above.

Thermostats are made to operate instantly or gradually. Those used on one-pipe steam radiators are called positive and close the valve quickly. Those used for motors on mixing dampers close very slowly to permit the gradual mixing of the warm and cooler air to maintain the uniform room temperature. This is called the graduated stat. This can also be used on a two-pipe radiator or on some modulating radiator valves. The posi-



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SECTIONS THROUGH POSITIVE THERMOSTAT.

tive stat must have a small diaphragm about ¾ in. in diameter on thermostat which controls the valve on the ⅛-in. pipe and instantly opens or closes the radiator valve.

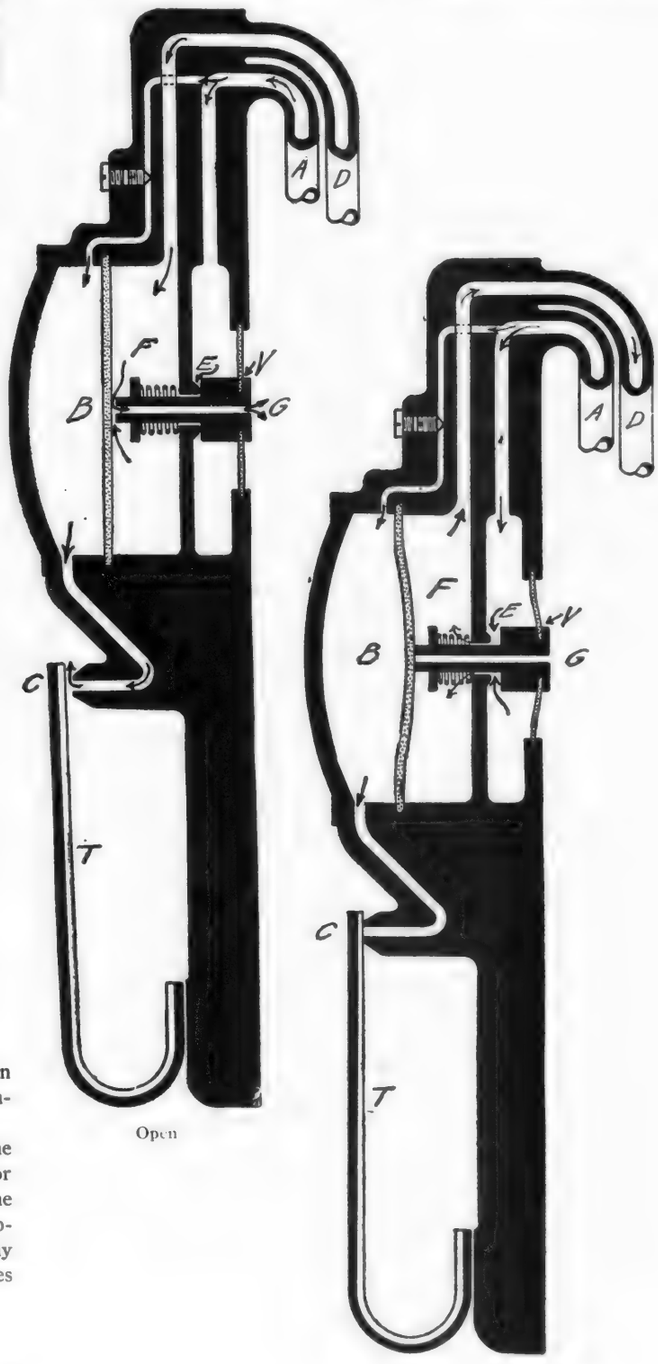
Until recently all the diaphragms both on the valves and on the thermostats were made of thin rubber sheets especially made for this work. This rubber soon dries out and breaks and one broken diaphragm lets down the whole system, so the spun copper bellows has largely taken the place of the rubber. Many engineers are replacing the rubber with the new all-metal valves and motors to cut down trouble calls.

MECHANIC SHOULD SPECIALIZE HEAT-REGULATION REPAIRS.

In a great city school system it is better to have a mechanic specialize in heat-regulation repairs. The writer does not now permit the custodian or principal attempt repairs or adjustment on thermostats but calls the engineer's office which is in touch with the expert mechanic. Any custodian with a mechanical mind can easily learn to make all repairs but it is a job that takes time and the proper tools and supplies. Let it be understood that the adjustment screw is not intended for the use of the teacher to operate at will. If it is not left as set, better loosen the set screw and make the indicator inoperative.

In gymnasiums and play rooms the thermostats should be protected with heavy metal covers. Positive thermostats work better on the dampers of such rooms. Strict rules must be made to prevent pupils or others from inserting anything into the mechanism or attempting to make any adjustments whatever. Have one authorized mechanic only.

Thermostats should be placed at a height approximating the



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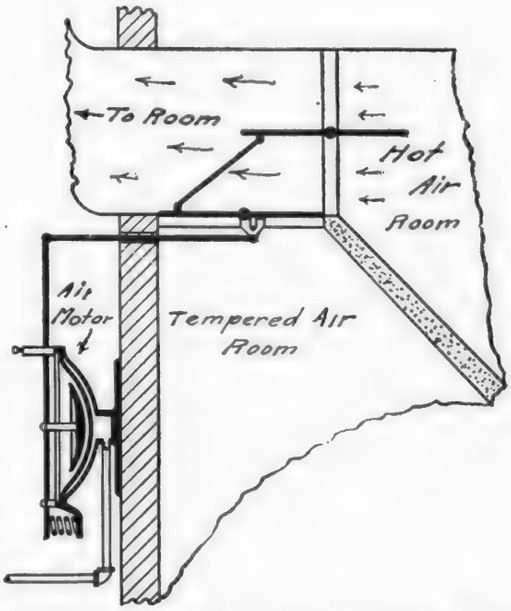
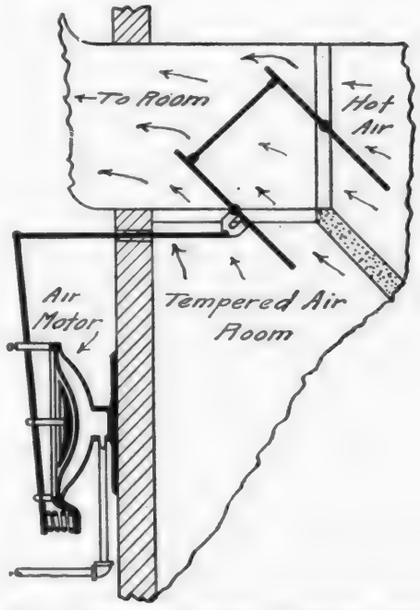
SECTIONS THROUGH GRADUATED THERMOSTAT.

desk level or the mechanic when adjusting them shall hang his test thermometer at that level in determining the correct temperature. It is better not to use the thermometer on the therostat.

Some very fine section views of one style of regulation apparatus are given to enable the mechanic to adjust and repair them. A close study should be made of them. In fact they should be cut out and mounted on cardboard and kept for reference. This cut of the mixing damper arrangement will give a clear idea of this mysterious mechanism. After mastering this system with these cuts the other makes will seem quite easy of understanding.



SECTION THROUGH MIXING DAMPER ASSEMBLY, SHOWING IT IN POSITION TO TAKE HOT AIR ONLY.



SECTION THROUGH MIXING DAMPER ASSEMBLY, SHOWING IT TAKE BOTH HOT AND TEMPERED AIR OR ACTUALLY MIXING.

Questions

1. What are the best reasons for using heat regulation?
2. What are the four elements of heat regulation?
3. Under what conditions is the water power pump best?
4. How can 10 lbs. of steam pump an air pressure of 15 lbs.?
5. Where the air pump stops does the steam go on or off the radiators?
6. Give directions for running a small steam air pump.
7. What will happen if the air pipe leaks?
8. What damage will dirt do in a pipe line?
9. How does water get into an air pipe?
10. Can you explain the use of all the parts of a positive thermostat?
11. What happens if a thermostat does not close a one-pipe radiator valve quickly?
12. What use is made of a graduated or slowly closing thermostat?
13. What effect has the bursting of a diaphragm on a radiator valve?
14. How can 70° be maintained in a room with a hot room at 110° and the tempered air at 55°?
15. With a supply of repair parts on hand what tools are necessary to repair thermostats?
16. With the illustrations on this page how long would it take to become proficient as a thermostat maintenance man?

OBSTACLES IN THE PATH OF GAS HEATING

Some of the Reasons Why This Ideal Fuel Is Not Making More Rapid Progress for House Heating

BY DAVID H. CUYLER.

AN EXPERIENCE extending over a term of five rather turbulent years has not yet produced one official connected with the gas-producing industries who will speak in disparaging words of the future wide use of manufactured gas as a house, warming medium. Maybe there are many such, but it has not been the writer's privilege to meet them, and he has met and talked with a good many.

Such being the case, it becomes increasingly hard to explain why there is not more real, whole-hearted activity among these interests. Certainly the trail has been well blazed, and every one has sufficient proof of a nation-wide interest in the subject of the use of gas-fuels for heating purposes. But inertia and sluggish interest are apparent all along the way.

A quest for information from many utility manufacturers has proved to be sufficiently instructive, so that we are forced to the conclusion that, generally speaking, the gas manufacturer is not anxious to have the gas-appliance industry grow far beyond its present bounderies, owing to the fact that "there is no money in gas sales nowadays," or, that such increase in demands for service would necessitate a very large addition in equipment, for which, at this time, he is not prepared to pay.

As there may be many who are interested in the heating industry who are considering the adoption of gas-fuel apparatus, it will be well to weigh these matters from the gas-man's viewpoint, for he indeed has a side to his story that we will want to know about. In doing this we will at least have the satisfaction

of knowing that we have acted conservatively in our own behalf, and unselfishly on the behalf of the other fellow.

OUTSIDE INFLUENCES WHICH ARE AFFECTING THE GAS INDUSTRY.

Under present-day conditions, when greed which is always the after-math of war is busy in all industries, we cannot doubt that our friends who control the gas-flow through the meters of the land, have a just cause for complaint in numerous cases where outside influences are pinching them. They are not making as much money as they have been used to make. Indeed, some of these sufferers are making a great ado over it, and uttering wild calls for help; claiming the near approach of bankruptcy and all such horrors commercial. We know of one case in a large eastern city, where the service company is struggling along under present materials-market inflation, with an ancient municipal contract hanging around its neck like a mill-stone. This company is still receiving $1.00 per 1000 cu. ft. for its product, and of this, the afore-mentioned mill-stone requires that they hand over twenty-five cents to the city, leaving the service company seventy-five cents gross for its total income. If the claim they make that it is costing them approximately ninety-five cents a 1000 cu. ft. to manufacture gas and furnish it to the consumer, they surely are deserving of heart-felt sympathy, to say the least.

This company, as is the case with most companies in the larger cities where service is confined to the manufactured product, furnishes the straight blue-water gas. It is a fact that this gas can be made and furnished at considerably less cost, if we consider alone the cost of gas-making materials.

INTEREST OF THE HEATING ENGINEER IN THE SUBJECT.

As was stressed in the series of papers devoted to the use of gas fuels for heating purposes, which lately appeared in these pages, the heating engineer is primarily interested in this subject from a purely economical standpoint. He will want to know when he can safely undertake to sanction and support a wider use of gas as fuel for heating purposes. This time is not yet,—of that fact we are well assured by the printed words of the gas men alone.

FURTHER REDUCTIONS IN CALORIFIC VALUE OF GAS BEING URGED.

Facts as culled from pages of the gas journals, lead one forcibly to conclude that the general trend of things is towards even greater reductions in calorific values than present standards demand. The constant cry all along the line is for lessened B. T. U. content, each of these pleas being festooned with explanations in formula and chart showing conclusively (?) where this gas company pudding is to be the consumers' beneficial sauce.

The heating engineer is not the least interested in the stated claim that a manufactured gas of 440 B. T. U. content will furnish as good an illuminating and cooking medium as does gas that contains 600 B. T. U. Quite naturally, in reading such claims, and knowing that it requires a certain amount of heat to do a certain amount of cooking, we may be excused if we exhibit a certain crude interest in asking to know the ground upon which this claim is based. But, as above stated, we are not interested in this matter beyond the point where it concerns an individual family budget.

In our own balliwick, we do know that each square foot of steam or water radiation that may be installed under the specifications we issue, will call for a varying number of heat units for each hour when in use. These heat units will have to be obtained from the fuel burned at the source of supply. Then it is quite evident that the heating engineer is abundantly interested in the fact that, all over the land, the gas companies are proposing to furnish product at rates running anywhere from $1.25 to $2.00 per 1000 cu. ft. and of a reduced heat unit content as low, in some cases, as 450 B. T. U., in lieu of a former satisfactory service at 80 cents to $1.00 per 1000 cu. ft. and of 600 to 650 B. T. U. content. The accompanying table (Table 1) quite well illustrates what this means where gas is to be used for heating purposes.

POSSIBILITIES OF THE FUTURE AS SEEN BY THE GAS MEN.

To hark back to the first few paragraphs of this paper, we may obtain quite a convincing foretaste of the future from a gas-man view-point by quoting R. B. Harper, who is chairman of the Technical Section of the American Gas Association. In the February 9, 1921, issue of *Gas Record,* he has contributed an enlightening paper in which he elaborates on the possibilities of the future. In summing up his conclusions, Mr. Harper states:

"From the standpoint of the economical use of possible gas-making materials, it appears that in the future, city gas may be made, as far as possible, by carbonizing gas coal in a by-product oven and using the coke so produced in water-gas machines to make a straight blue-water gas, to be mixed with the surplus oven gas. Such a gas would consist of about 80% to 85% of the blue-water gas and 15% to 20% of surplus oven gas, giving a mixed gas having a total heating value probably somewhat less than 350 B. T. U. per cubic foot."

It is true that in adopting this mixture, and thus eliminating the gas-oil required for present standards, the expense incurred through the purchase of this gas-oil would be saved to the gas companies, but it will require no expert knowledge to see that the adoption of such a method will effectually reduce, if it does not wholly annihilate, the possibility that manufactured gas can ever be used for heating purposes to any great extent.

GAS COMPANIES BEING RESTRICTED IN THE USE OF GAS-OIL.

Now, in this quest for means to reduce or to wholly eliminate the use of gas-oil in the making of retort gas, we must play fair with the gas man. The facts are that at present the gas companies are fighting tooth and nail for even the restricted amounts of this material they are permitted to use. As concerns the gas manufacturer, the oil market is not a selling market in any sense of the word. Investigation shows that this is a case of the vicious circle, with the well-known public on the outside looking in.

TABLE 1—GAS FUEL REQUIRED FOR STEAM AND WATER RADIATION

Varying Calorific Values

Steam Radiation—240 B. T. U. per hour.
Water Radiation—150 B. T. U. per hour.

Total cubic feet of gas required per hour—15 per cent added for waste

Sq. ft. Direct Rad	B. T. U. Value of Fuel Gas											
	500		525		550		575		600		650	
	S	W	S	W	S	W	S	W	S	W	S	W
200	110	69	105	66	100	63	96	60	92	57	85	53
225	124	78	118	74	113	71	108	67	104	65	95	60
250	138	84	132	80	125	77	120	73	115	70	106	65
275	152	95	144	90	138	86	131	82	126	79	116	73
300	165	104	158	99	150	94	144	90	138	86	127	80
325	180	112	172	107	163	102	156	98	149	94	138	87
350	192	121	185	115	174	110	166	105	162	101	148	93
375	207	129	199	124	188	118	179	113	175	108	159	100
400	220	138	210	133	203	126	192	120	186	115	172	106
425	232	146	223	139	212	133	204	127	196	122	181	113
450	248	155	236	148	226	141	216	135	207	129	192	119
475	262	164	250	156	238	150	228	143	218	137	202	127
500	276	172	263	164	251	157	240	150	230	143	212	133
525	290	181	276	173	263	165	252	158	241	151	222	140
550	304	190	289	181	276	173	264	165	253	158	232	146
575	317	198	302	189	288	180	276	173	264	165	244	153
600	331	216	315	206	305	196	288	188	276	180	252	166

The gas companies are bound tight to municipal or other governmental regulations which require certain B. T. U. stand-

ards to be furnished by them, and, generally speaking, these standards are quite forcibly insisted upon. To obtain these standards in the product furnished, the service companies are compelled to "build up" the calorific values of the product by the addition of gas-oil. The service companies are operated under the stringent regulations which further control selling rates, while the oil companies are not so restricted. These oil companies very naturally seek those markets where the highest prices are to be obtained, and these markets are found to be those where the crude petroleum is converted into gasolene or motor fuels, so the gas companies have had to assume the attitude of the suppliant, rather than that of the sought-for customer.

LOWER PRICES OF GAS NECESSARY, FROM A HEATING STANDPOINT.

A careful perusal of Mr. Harper's well-written paper will leave little to hang a mantle of optimism on. If we are to base thought upon his words, the gas man has little or nothing to offer that will be of interest to the heating engineer, unless the "low calibre" product he promises is to be marketed at a price that will be far below anything we have known in the past few decades.

Basing an assumption on the future realization of Mr. Harper's prophecy, we have made up the small table (Table 2) showing

TABLE 2—SHOWING THAT THE COST OF 350 B. T. U. GAS IS JUST DOUBLE THAT OF 600 B. T. U. GAS

Fuel Required for Steam and Water Radiation

Coal—6000 B. T. U. available
Gas—350 and 600 B. T. U. available
Steam Radiation—240 B T U.
Water Radiation—150 B. T. U.

Coal figured at $12.00 Ton.
Gas figured at $1.00 per 1000 cu. ft

Total cu. ft. gas and pounds of coal required per hour—15 per cent added to gas quantities for waste

Sq Ft. Direct Radiation	Gas 350 B. T. U.		Gas 600 B. T. U.		Anthracite Coal 6000 B. T U.	
	Cu. Ft.	Cost	Cu. Ft.	Cost	Pounds	Cost
200	157	$0.16	80	$0.08	8	$0.048
300	276	0.28	120	0.12	12	0.07
400	315	0.32	160	0.16	16	0 096
500	395	0.40	200	0.20	20	0.12
600	473	0.47	260	0.26	24	0.144

what 350 B. T. U. gas would be worth as a heating medium. A study of this chart is discouraging, to say the least, especially to those who have hoped for a brighter outcome for this very attractive dream of the future.

The total estimated requirements of gas-oil for the whole of the United States are somewhat over 18,000,000 barrels per annum. Of this total, New York is the largest consumer with its requirement of nearly 7,000,000 barrels. Illinois follows with about 2,100,000 barrels and Pennsylvania next with nearly 2,000,000 barrels. Then the terse sentence contained in Smithsonian Bulletin No. 12, Vol. 1, entitled "The Energy Resources of the U. S.; a Field for Reconstruction," is sufficiently relevant,—

"The use of gas-oil, a high-grade fuel oil, in the manufacture of city gas, represents a practice largely unjustifiable on the basis of resource economy."

Here, then, is a vision of the future from the gas man's viewpoint, and such facts as we have been able to get from a more or less casual investigation may be taken as a basis for the evident inertia or lack of interest that we find among these people at this time. Certainly, something is wrong somewhere, for it is not at all a healthy condition where we find an industry that abhors the very idea of natural expansion, and we offer it as a suggestion that, where conditions extant seem to compel the general adoption of reduced standards rather than higher, there is sufficient cause for misgiving.

GAS STILL REMAINS AN IDEAL FUEL.

We have little sympathy with all this, for time has healed all sores, and we are certain that time will heal this one also. The fact still remains that gas is the handiest and cleanest fuel for all combustion purposes. It still is a fact that everyone would use it in preference to coal if they were permitted to do so from the standpoint of economy and efficiency.

Then we may call it another engineerig problem of the future, when the different elements of interest will get together and work out the kinks which at the present time seem almost insurmountable.

The accompanying charts will be useful to those who may be considering the use of gas-fired heating apparatus.

BACK TO FIRST PRINCIPLES

An Elementary Course in Heating and Ventilating Engineering

Lesson No. 3—Heat Transfer Methods

BY REID DAVIES

LESSON 2 was devoted to a development of the subjects of heat transformations, sources, and manifestations. But this section of the course would be incomplete without treatment of the subject of heat transfer methods, which is inseparably related to the subjects just mentioned.

HEAT TRANSFER METHODS.

Of interest to the heating engineer are, not only the ways in which heat makes its presence manifest, but also the methods by which it is transferred from one place to another. These methods of heat transfer—three in number—are known as,

Convection,
Conduction, and
Radiation.

CONVECTION.

The simplest method of heat transfer is convection. This implies the moving of the substance which has been heated, from one place to another. Obviously the moving of a substance which has been heated, effects a corresponding movement of the heat which it contains.

CONDUCTION.

Conduction of heat is the means by which heat energy, added to a material body at one point, is transferred to other points in this body and to points in other bodies which have material connection with the body to which heat is applied. Heat energy is generally understood to be the result of motions of the molecules of the substance from which it is being released. Conduction is believed to be the process by which heat travels through the substance, due to the impacts between molecules. The amount of thermal energy conducted through a substance varies with the thermal conductivity, absorptivity, and expansibility of the substance, with the temperature to which one point of it is heated, with the distance from the point heated to any other point of particular interest, and with the cross-sectional area of the heat path between these points.

RADIATION.

Phenomena of heat radiation are closely related to those of transmission of electro-magnetic and of luminous radiations. All three of these are forms of aether wave motion, initiated by the molecular vibrations of material substances. Their principal difference in character seems to consist in a difference in wave length (as shown in the following table), although each form has special effects—physical, chemical, and biological—peculiar to itself.

Thermal radiation has been investigated experimentally in many ways and has been found to possess the following characteristics, similar to those of luminous and electro-magnetic radiations, they:

1 Can be transmitted through a vacuum;
2 Are transmitted in straight lines, radiating from the heat source in three dimensions;
3 Are reflected from polished metal surfaces;
4 Can be refracted;
5 Can be polarized; and
6 Are transmitted through space at a velocity of 186,000 miles per second.

And another point of similarity between thermal and luminous radiations is the fact, experimentally determined, that the heat produced per second at a surface of given area, by the absorption of thermal radiations emitted by a body at a constant temperature, is inversely proportional to the square of the distance between the body and the absorbing surface.

TABLE 3—WAVE LENGTHS AND FREQUENCIES OF CHEMICAL, LUMINUS THERMAL, AND ELECTRO-MAGNETIC WAVES.

Kind of Waves	Wave lengths in inches	Frequencies in Vibrations per second
Chemical		
Ultra-violet, shortest measured	.0000039371	3,000,000,000,000,000
Luminous		
Violet, shortest visible	.0000153	773,000,000,000,000
Blue	.0000178	664,000,000,000,000
Green	.0000205	577,000,000,000,000
Yellow	.0000230	514,000,000,000,000
Orange	.0000242	488,500,000,000,000
Red, longest visible	.0000303	390,000,000,000,000
Thermal		
Infra-red, longest measured	.0039371	3,000,000,000,000
Electro-magnetic		
Shortest Hertzian waves	.2361	50,000,000,000
Righi's oscillator	1.023	11,000,000,000
Hertz's rectilinear oscillator	23.61	500,000,000
Hertz's first oscillator	393.71	30,000,000
Leyden jar oscillator	118,113.	100,000
Commercial alternating current	98,428,000.	120
Note that the product of Wave Length × Frequency is constant for these waves.		

From "Principles of Wireless Telegraphy" by Pierce—McGraw-Hill.

Comments on Recent Automatic Ventilator Tests

BY A. J. MACK.*

A series of tests of a comparative nature on automatic ventilators, very similar to those conducted by the Bureau of Standards, were conducted by the Engineering Experiment Station of the Kansas State Agricultural College. It is on the results of these tests, as compared with those obtained by the Bureau of Standards, that the following comments are based.

The Kansas tests were conducted chiefly to determine the effect of the wind on various types of ventilators and did not include, to any great extent, tests of the effect of difference in temperature. Consequently the comments will be based chiefly on wind effects. In the Kansas tests the ventilator was placed entirely within a wind tunnel which was considered of ample size for the ventilators tested, whereas the ventilator in the Bureau of Standard tests was placed beyond the tunnel. The ventilator pipe in the Kansas test extended through the floor of the tunnel about 1¼ ft. and had a total length of 1½ ft. as compared to a ventilator pipe of considerable length and having a right angle bend such as used in the Bureau of Standards tests. These variations in equipment evidently would make the Kansas results higher and they should approach nearer actual conditions.

The method of rating the ventilators used in Bureau of Standards paper is very convenient and proper. The Kansas tests show some ventilators to be less capable of exhausting air than an open pipe and in this respect agree with the Bureau of Standards tests. It is noted that the best ventilators in the Bureau of Standards tests were capable of exhausting 1.5 times as much air as an open pipe. The best ventilators tested by the Kansas Station were capable of expelling 1.7 times as much air as an open pipe. Evidently from their figures, the Bureau of Standards had a velocity of air in the ventilator pipe of 180 ft. per minute at a wind velocity of 10 miles per hour, whereas in the Kansas tests a velocity of 290 ft. per minute was obtained. This is apparently a wide variation. It is probably due in part to the arrangement of the equipment and to the greater air friction in the pipes used in the Bureau of Standards tests.

A close examination of the results of the Kansas tests reveals the fact that the ventilating capacities of most of the ventilators could be improved by more judicious design, especially in the matter of dimensions used, as well as of general design such as the location of the hoods, bands, etc. In this matter the Kansas tests and Bureau of Standards tests agree. They also agree in that the simpler types are sometimes more efficient than the complicated designs, thereby showing that there is no advantage in some of the means used in an attempt to increase the effect of the wind.

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The Heating System for the Girard Estate, Philadelphia.

Interesting details regarding the installation and operation of the forced water circulation heating system for the 481 houses, stores and apartments known as the Girard Estate, in Philadelphia, were given at the recent annual meeting of the heating engineers' society by Robert Hughes, chief engineer of the plant. In addition to furnishing heat for these buildings, the power plant also supplies light and domestic hot water. All this is accomplished with an average of 89 lbs. of No. 2 buckwheat coal per day per home.

THE HEATING SYSTEM

Installed in the Passyunk power plant, which supplies the Girard Estate, are five water-tube boilers, with a total of 1730 H. P. These boilers are equipped with steam blowers directly connected with each boiler. The boilers are designed to use buckwheat coal, which is weighed on a platform scale as it is received and again weighed on an overhead electric hopper scale as it is used.

A Venturi meter is used to measure the amount of water evaporated, so that a very exact record may be kept of the amount of coal consumed per pound of water evaporated. As all the condensation returns to the boilers, very little trouble is experienced with scale.

EVANS-ALMIRALL SYSTEM USED.

The heating system is known as the Evans-Almirall system of hot water circulation. There are three high and two low-pressure heaters, two steam turbine, driven pumps, with a capacity of 1400 gal. per minute each, and one electric-driven pump, with a capacity of 1400 gal. per minute. Pumps are of the De Laval type, the high-pressure heaters of the Almirall make and the low-pressure heaters are one each of the Wainwright and Alberger manufacture.

When the outside temperature is 10° F. a temperature of 196° is maintained at the power plant and delivered to the operation at the rate of 3000 gal. per minute from the pump as registered by a flow meter, returning at a temperature of 166°, after supplying 70° heat to approximately 500 houses. From ten to fifteen radiators or 450 sq. ft. to 600 sq. ft. of radiation are used in each house, which contain from nine to eleven rooms. The total radiation is approximately 250,000 sq. ft.

The supply and return mains are 14-in. in the power house and are large enough to take care of about 400 more houses. Ten-inch mains are used from the power house to the present operation. Each house is controlled by valves so throttled that a uniform temperature is maintained in each house. In case of a break, these valves may be shut off without interfering wih the rest of the operation.

Packed expansion joints are used on all piping to care for expansion and contraction. Where mains run under ground, the expansion joints are anchored in concrete piers large enough to permit the use of a covered manhole. These manholes are of easy access and are drained to the sewer in case of a leak. There are about 185 expansion joints in all ranging in size from 1½ to 10 in. All valves on the heating system are of the lock-shield type and, once set, cannot be tampered with.

A closed expansian tank is used carrying a pressure of about 35 lbs. with about a 10-in. air cushion at the top. This is sufficient to maintain water at the highest point in the radiation.

Located in the tunnel, a thermometer is placed on the return piping from each pair of houses. This serves as a guide for an equal distribution of heat regardless of exposure.

No trouble has been experienced from corrosion. Sections of pipe which have been taken out are as clean as when they were installed.

Two storage tanks of 1500 gal. capacity each are placed sufficiently high to feed the boiler-feed tank by gravity. As a further safeguard, a concrete tank of 11,000 gal. capacity, supplied from an artesian well 650 ft. deep and 8 in. in diameter, furnishes 600 gal. per minute delivered by air pressure. This tank is cross-connected in the power house, so that water may be supplied in case of a break in the city main.

There are 6,000 1in. radiator valves 2,000 1½, 2 and 2½-in. control valves, 5,500 ½, ¾ and 1-in. cold and domestic hot water control valves, 1,000 ½, ¾ and 1-in. cold and hot water valves in the tunnels, and 4,500 faucets, making a total of 19,000 valves in all.

There are 1,000 toilets on the operation and 100 valves from ½ to 14-in. in the power house and heating lines.

The power house system of heating is so arranged that in case of a break to any one set of heaters or turbines, the plant can be operated independent of the break. Since the erection of the Passyunk Power Plant in 1908, the heating has never once been shut off from the entire operation at any one time during any heating season.

DOMESTIC HOT WATER.

The domestic hot water is heated by high and low-pressure heaters of the Wainwright and Alberger types, the low-pressure heater being 6 ft. long and 18 in. in diameter and the high-pressure heater being 5 ft. long and 14 in. in diameter.

40,000 to 55,000 gal. of water are delivered to the operation every 24 hours by two Deane pumps. The supply pipes consist of a 4-in. main and a 3-in. return, the main feed to each house being ¾-in. circulating through each pair of houses.

All piping under ground is covered with Wyckoff wood covering and in the tunnels and cellars with 85% magnesia. All tunnel and cellar lines are so valved that trouble in any house does not interfere with the rest of the operation. The water leaves the power house at 160°.

The feed to each row of houses and the manner of regulating a uniform circulation is as follows:

A supply line for each row is run from the main, controlled by a valve, and continues to the end of that row, where it is controlled by an operating wheel valve. Thermometers, pressure-gauge connections and regulating lock-shield valves to returns are used to insure an even temperature in all houses. The travel in all is about 12,000 ft. feed and 12,000 ft. return.

A duplicate set of heaters and pumps are in service, so that in case of a break at any time the system is not without water.

Corrosion in the domestic hot water lines has given considerable trouble. Pipes which have been removed have been so corroded that it was almost impossible to see through them. A deactivating system, furnished by the Anti-Corrosion Engineering Company, has been installed and has been in operation since about November 15, 1920. Samples of pipe taken out four weeks after the installation of this apparatus show that it is very satisfactory, for the rust is softening up and passing on through the system into the filters. Within a very short time it is expected that the system will be entirely cleared of corrosion.

When the power plant was first installed in 1908, one pump was operated, carrying a pressure of 30 lbs., with a good circulation of hot water throughout the whole operation. As time went on, the pipes became corroded more and more, so that it was necessary to use two pumps with a pressure of 40 lbs., and then complaints were received of lack of water at different parts of the system. Since the deactivator has been in operation, we have shut one pump down and the pressure has been reduced again to 30 lbs. and no complaints for hot water have been received.

Since the rust is dissolving, it is necessary to readjust the valves, as the water is coming back too freely. In November, nineteen pieces of pipe were renewed, while in December, only thirteen were renewed, and up to date (January 25, 1921) none renewed.

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MUCH as we deplore the wholesale manner in which investigating committees have seen fit to indict entire groups of manufacturers, jobbers and contractors in the heating and plumbing lines, on price-fixing and other charges, we feel that there is nothing to be gained in glossing over the abuses themselves, as is being done in several quarters. The investigators are being referred to derisively as "reform" committees. Good men's names, runs one complaint, will be dragged into the mire, a comment that leaves the impression that the investigating committees might have found better things to do than to delve into the conduct of the various business associations connected with the industry.

Now the fact is, and it might as well be stated, that the evidence already brought out by the investigating committees discloses basic conditions, especially in the plumbing industry, which have been perfectly well known throughout the trade for years. It is beside the point, in our judgment, to palliate the offences by stating that the associations involved have, nevertheless, been the means of greatly advancing the art. No one can read the evidence brought out in the New York investigation, for instance, without realizing that there was much more than "underlying and unqualifiedly bad features connected with the conduct of certain building associations" that needed to be remedied.

The various building trades are very distinctly on trial and the wise and courageous thing to do is to convince the public that the trades, as a whole, are not to be considered as condoning such practices as price-fixing, marketing monopolies, or any of the other abuses which have been shown to exist. Moreover, the way to do this is to back up the purpose of the investigation and take prompt measures to clear the names of those organizations whose objects and records are known to be entirely above-board. We have in mind particularly such organizations as the National Trade Extension Bureau whose efforts to "build bigger business" through the education of the heating and plumbing contractors, both in running their business and in developing their respective fields, have been of the greatest help to all concerned.

Nothing would please the real offenders more than to have the investigating committees run amuck by herding the innocent with the guilty and in that way discrediting their work in the eyes of the public. This might serve to becloud the issue for a time but it would leave an unhealed sore that would be bound to cause trouble again.

THE evidence of improper business practices in the building industry, however, is far from being the sole reason for the slow revival of construction work, although it is concededly one of the principal causes of high prices. Those who followed the recent conferences of the construction industries in Philadelphia and Chicago heard many enlightening discussions of the profits of manufacturers and retailers, as well as of their costs of production. As was to be expected, the general cry throughout both conferences was that "Labor must come down." In fact, so persistent was this feeling that the sessions devoted to the views of labor easily held the center of interest. Labor's spokesmen, of course, with a few notable exceptions, stood steadfastly for the present wage scales, basing their arguments on the point that as merchandise prices rose considerably in advance of wages, the decline should follow the same course. The entire presentation of Labor's side of the question, however, evinced a gratifying change of spirit from that of former days and one that may easily decide the present issue over the open and closed shop. In other words, union labor has a fine opportunity to show that skill and efficiency, rather than regularity, are the prime reasons for its existence.

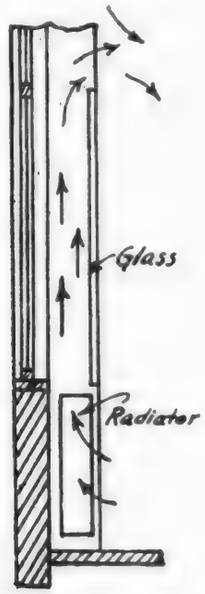
COAL economy schemes, forced upon the English by the scarcity, to say nothing of the high cost, of coal, are taking a curious turn, proving again that necessity is often the mother of invention. While we in this country have been developing combination stoves and boilers, made up in single units, the English have gone a step further in perfecting a combination cooking stove and house heating boiler. The same idea is also being applied to a combination boiler and cooking oven, the flue outlet of the boiler being connected to a flue-encased oven, with an estimated saving of 75% of the fuel used for cooking. Of equal interest is a boiler designed for continuous domestic hot water supply, house heating and cooking, all from one fire.

Such developments as these, especially when taken in connection with the new heating devices now on the American market, as well as those shortly to be announced, leave no room to doubt that we are going to see shortly some decided changes in present-day heating practice, at least in connection with the smaller class of installations.

WRINKLES

Prevention of Down-Drafts from High Windows.

Down-drafts are caused by the high windows in banks or similar buildings but these may be overcome by the use of plate-glass shields, as shown in the illustration.



SHIELDS TO PREVENT DOWN-DRAFTS FROM HIGH WINDOW

These shields have the effect of a flue so that warm air from the direct radiation is delivered at an elevation sufficient to overcome the down currents.

Special Exhaust Systems.

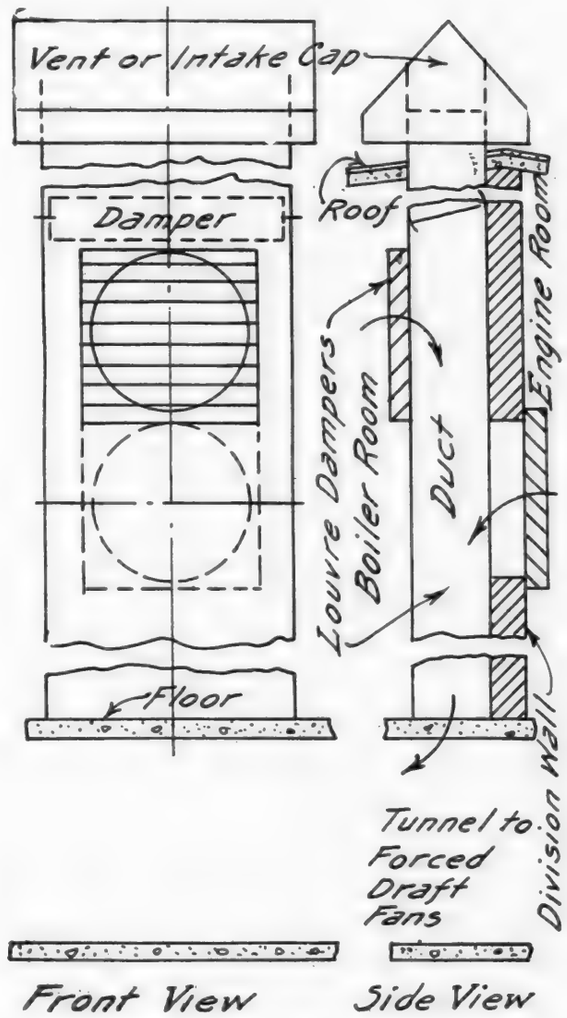
Wherever dust, odors, vapors and heat are liberated in any considerable quantities a special exhaust system should be provided to carry off such products. This should include hoods over or enclosing the devices producing the dust, odor, vapors or heat with connecting ducts to an exhaust fan discharging independently of any other ventilation system. Many States, including New York, have special regulations covering such exhaust systems.

The excess air exhausted from rooms, as referred to above, will in part be made up by excess air which may be supplied in the general rooms, but should any deficiency still remain, this may be made up by air introduced into the corridors. This has the special advantage of lessening the likelihood of air bearing heat, vapors or odors communicating from the rooms requiring special ventilation to the other rooms of the building, and it also will help lessen the in-leakage around windows, doors, etc., throughout the building.

Method of Ventilating Boiler Rooms.

In the case of boiler and engine rooms, the boilers, piping and other equipment give off considerable heat which rises to the ceiling where the temperature soon becomes many degrees higher than at the floor level, even when gravity roof ventilators are installed. The higher the room, the more unbearable will be the temperature conditions to those who make repairs or use the overhead walkways at steam headers and control valves. The extreme degree of heat may even cause sprinkler heads to operate while the condensation or swating on cold water pipes is greatly increased.

Ordinarily the air required for combustion under boilers is supplied from the colder and heavier air near the floor level and must be raised in temperature to the temperature of the fire. However, with an arrangement as illustrated the air at highest temperature may be taken from the upper part of the rooms. This method will cool the lower levels as well as the upper and make a certain amount of saving in the heat required to raise the air to the temperature of the fire.



DUCT FEEDING WARM AIR FROM BOILER ROOM TO FORCED DRAFT FANS

In the arrangement shown, the duct is connected at the floor to the fan room or to the inlet of the forced draft fan, while the top of the duct opens through louvres to the boiler and engine rooms. The duct is also fitted at the top with a damper so that if desired the heated air of the upper levels may be vented to above the roof. The damper and louvres are fitted

for operation from the floor and the duct should be protected for 8 ft. above the floor by means of a heavy sheet steel guard or enclosure.

Heating Paper Mills with Waste Vapor.

A novel scheme for increasing the capacity of a heating plant for a paper mill was described by W. H. Howell, Jr., before the Technical Association of the Pulp and Paper Industry, in connection with the ventilating system designed by E. A. Briner for the Champlain Mills of the New York & Pennsylvania Company.

As Mr. Howell stated, the usual practice has been to heat fresh air from outdoors by carrying it over steam coils, blowing it into the room and taking out the moisture from the driers, either by having openings in the roof or with exhaust fans. This system has been quite highly developed and gives satisfaction provided it is properly installed.

At the mill referred to, this old system was in use, but as the production was increased about 100%, it was found to be inadequate. It was then arranged to ventilate the machine room with two fans. One exhaust fan is used for pulling moist air out of the machine hood to the economizer and a supply fan distributes the warm air to various points in the room. The hot outgoing air and the fresh cold air crisscross each other in the economizer without actual contact except through corrugated plates. The object of the corrugated plates is to enable the closets possible contact for transmission of heat from hot moist air to the cold fresh air, at the same time separating the moist air from the dry air. Both fans are belt-connected to a single 20 H. P. constant-speed electric motor.

In average winter weather (34° F.) the economizer is able to raise the outdoor air to 107° F. for distribution in the machine room in quantity sufficient for all ventilating purposes and without the use of any steam whatsoever. This result is accomplished solely by utilizing the waste vapor going out of the machine hood and still leaving a large quantity of vapor available for other heating purposes.

It was found that 107° was too warm for the comfort of the operators, and a certain amount of moist air was consequently allowed to escape into the atmosphere without passing through the economizer, so as to bring the air temperature supplied to the room down to 98° or 100°.

Mr. Howell stated that, so far as he knows, this is the first practical use of the idea on a large scale for heating and ventilating a machine room without the use of steam from the boiler plant. By its means first-class ventilation conditions are assured in a place that formerly presented a very difficult and expensive operating condition. Of course the intention is also to use such waste heat in some cases to assist drying operations in summer.

New Heat Transmission Chart.

Supplementary to the inquiry and answer published in THE HEATING AND VENTILATING MAGAZINE for April, 1921, on "Heat Transmission from Radiating Surfaces for Various Steam Pressures and Temperatures," the accompanying chart will be found useful in determining such transmission. Its notable feature is that it covers transmission from heating surfaces for steam pressures varying from 1 to 100 lbs. gauge.

Taking the same example as was given in the reply referred to, we will assume a room temperature of 60° and a steam temperature of 230°, which gives a temperature difference of 170°. This is 20° more than the standard conditions of 150°, and allowing 2% for each 10° variation, the values must be increased 4%. Assuming a 2-col. radiator 32 in. high, the Factor is 1.71.

$1.71 \times 0.04 = 0.068$.

$1.71 + 0.068 = 1.778$ B. T. U. per degree difference.

$1.778 \times 170 = 302$ B. T. U. per square foot per hour.

LEGAL DECISIONS

Construction of a Cost-Plus Agreement.

The Georgia Court of Appeals was called upon to construe a cost-plus contract for the installation for the Atlanta Terminal Company of a new six-inch steam main in the Atlanta Terminal Station from boiler room to east side of train shed and a five-inch main from there below the passenger concourse to the west side of the train shed, and also new branches for car heating, telegraph office and signal towers, all to be complete with valves, pipe coverings, etc., as described in plans and specifications. The contractor was to have 15 per cent of the total costs and outlays for labor, materials, supplies and other expenses in connection with the work. In an action on the contract the contractor claimed that his compensation should include 15 per cent of the cost of pipe covering furnished and supplied by another company, but the trial court denied the claim. This is affirmed by the Court of Appeals, Heer v. Hines, 105 S. E. 850, as being sustained by the terms of the contract and the evidence of the contractor.

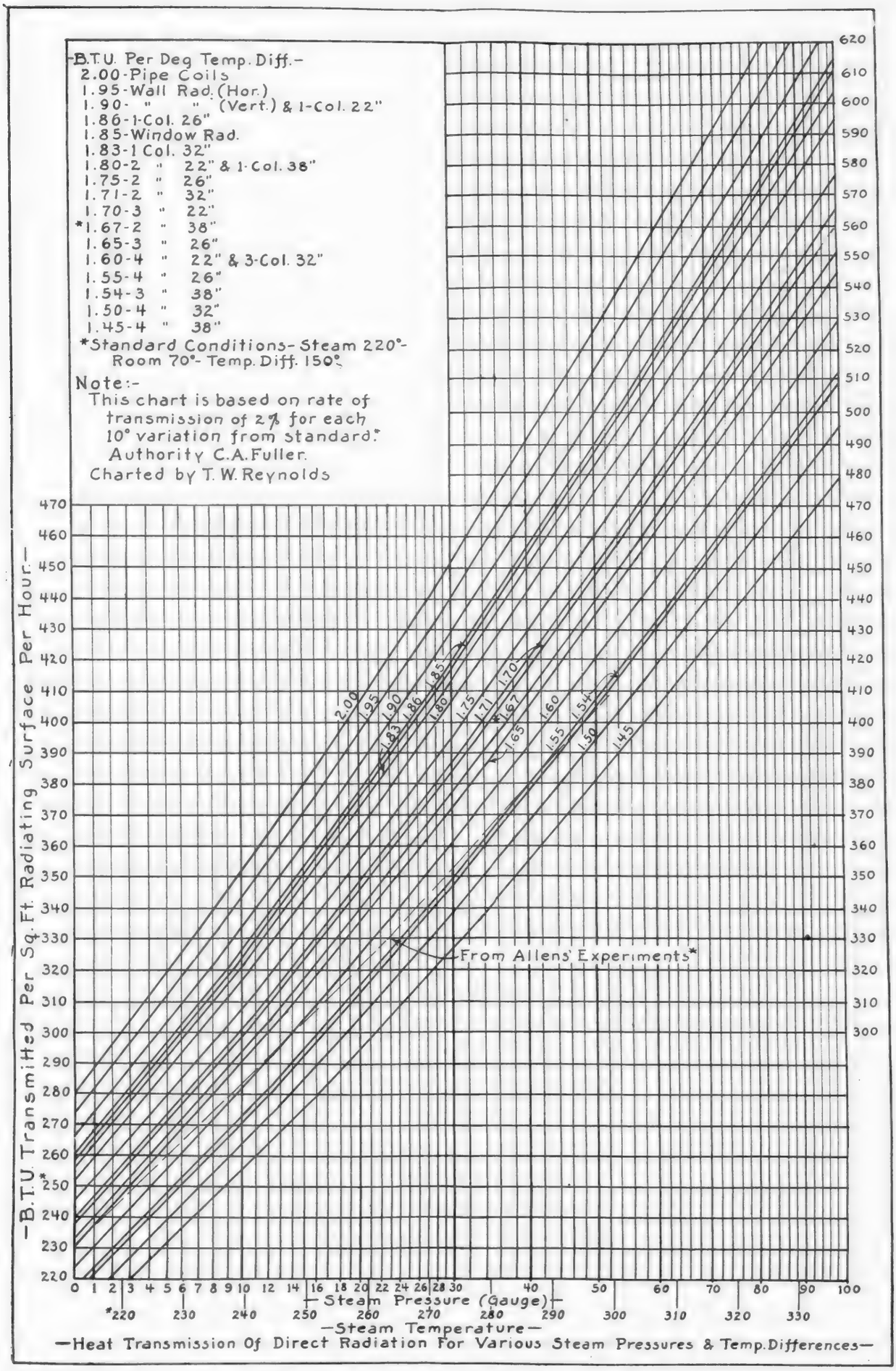
Service-at-Cost Plan Authorized for Hot Water Heating Plant.

The Indiana General Service Company was authorized by the Indiana Commission to put into effect a revised schedule for hot water heating in the city of Elwood. The new tariff consists of a service charge of 9 cents per sq. ft. of radiation with, in addition, a monthly hot water charge per sq. ft. of connected radiation subject to billing, which should be determined by taking the total operating expenses, taxes and depreciation and dividing the total thereof by the total number of sq. ft. of connected radiation subject to billing.

This schedule is based on the theory that the Commission should fix the value of the investment, or value of the property for rate-making purposes, and also fix a rate of return thereon; that a service charge should be authorized sufficient, and only sufficient, to pay the owners of the utility the return to which they are entitled; that the remainder of the charge per sq. ft. of radiation should be an elastic charge depending upon the total expense of operation for that month; that the accounts of the utility should be, as they are now, kept in accordance with the standard system of accounts prescribed by the Commission, and the total operating expense for each year charged to the consumers upon the basis of the actual cost of furnishing the heat. In other words, the proposed plan assumes that the utility is entitled to a certain return on the value of the property as fixed by the Commission, which is to be realized from the service charge; and in addition to the service charge, the consumers are to pay to the utility the actual cost of the service each heating season.

The Commission adds that this plan would not be practicable or satisfactory if it were not shown by the evidence that the Indiana General Service Company is operated with high efficiency. The evidence further showed that its records and accounts are kept in strict accordance with the requirements of the Commission. The condition of its plant equipment, the quality of the service furnished, and its books, all indicated that operating expenses are kept to the minimum consistent with good business management. The Commission also said as to the service-at-cost plan:

"The principal objection raised to the service-at-cost plan is that it has a tendency to weaken the efforts on the part of the utility to economize in its expenditures for operation.


B.T.U. Per Deg Temp. Diff.-
2.00-Pipe Coils
1.95-Wall Rad. (Hor.)
1.90- " " (Vert.) & 1-Col. 22"
1.86-1-Col. 26"
1.85-Window Rad.
1.83-1 Col. 32"
1.80-2 " 22" & 1-Col. 38"
1.75-2 " 26"
1.71-2 " 32"
1.70-3 " 22"
*1.67-2 " 38"
1.65-3 " 26"
1.60-4 " 22" & 3-Col. 32"
1.55-4 " 26"
1.54-3 " 38"
1.50-4 " 32"
1.45-4 " 38"
*Standard Conditions- Steam 220°- Room 70°- Temp. Diff. 150°.
Note:-
This chart is based on rate of transmission of 2% for each 10° variation from standard.*
Authority C.A. Fuller.
Charted by T. W. Reynolds
From Allens' Experiments*
-B.T.U Transmitted Per Sq. Ft. Radiating Surface Per Hour-
-Steam Pressure (Gauge)-
-Steam Temperature-
-Heat Transmission Of Direct Radiation For Various Steam Pressures & Temp. Differences-

NEW HEAT TRANSMISSION CHART FOR RADIATORS

CORRESPONDENCE

Do's and Dont's in Heating Garages.

EDITOR HEATING AND VENTILATING MAGAZINE:

The enclosed sketch (Fig. 1) shows a layout for a small garage heating system. Will you kindly tell us if it is possible to make this work and how?

As you will notice, the tank heater is placed in the back end of the dwelling and the piping runs underground from that point to the garage which is 40 ft. away from the house, the garage being on a lower level than the floor on which the tank heater is placed.

Philadelphia, Pa.

S. R. E.

It is impossible for hot water to flow by natural means to cooling surfaces placed at a lower elevation than the point where heating takes place. Cold water, of course, tends to lower and hot water to rise and the latter, if caused to lower, is likely to air bind at the high point where it starts to drop. This is shown

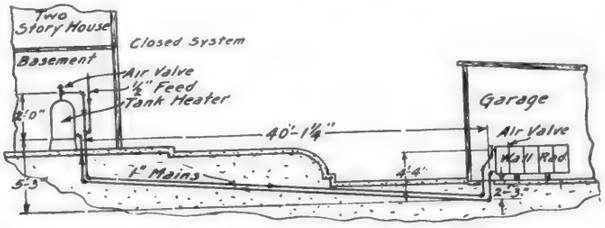


FIG. 1—CORRESPONDENT'S PROPOSED METHOD OF HEATING GARAGE AT LOWER ELEVATION.

graphically in Fig. 2. To meet the requirements of the problem, hot water must flow in the directon indicated by the arrows, and this flow depends upon the difference in weight of the two columns of water, one hot and the other cold.

If it were possible for hot water to reach the radiating surfaces, it would cool at this point and then lower, because of its relatively greater weight per cubic foot. In doing this, it would displace and raise the water in the heated column (No. 1) which is lighter. But the water in Column 1 is made up of hot water above the heater and cold water below, and the latter is greater in height and amount, and, therefore, weight. Consequently, it could not be lifted by the descending currents of Column 2 and

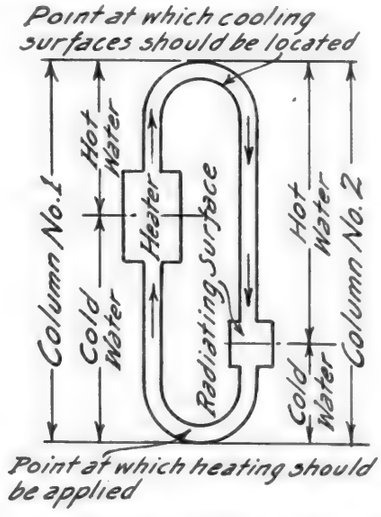


FIG. 2—DIAGRAM SHOWING WHY PROPOSED METHOD WILL NOT WORK.

the flow would not take place in the direction indicated, nor, for that matter, in any other direction. This system as proposed would be more apt to work if the buildings or else the heater and radiators were reversed in location or elevation.

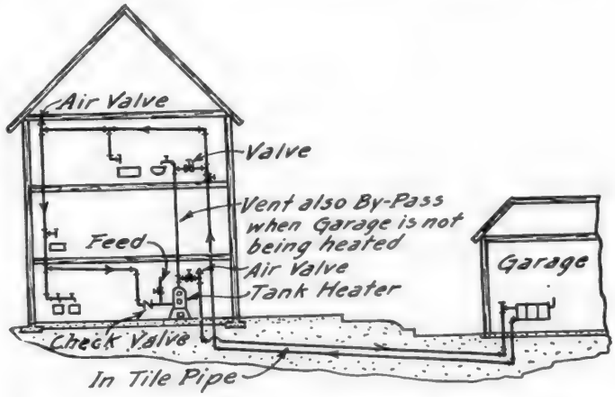


FIG. 3—SCHEME FOR HEATING GARAGE FROM DOMESTIC HOT WATER SERVICE LINES.

The correspondent's sketch (Fig. 1) does not show clearly what provision has been made for expansion of water. Expansion may take place against city pressure or through a relief valve. In any event the system in question is closed and must be automatically relieved whenever the necessity arises.

Pipe sizes as given in the sketch are very small. With the horizontal distance between the buildings 40 ft., this makes the friction high, a thing not desirable where the motive power is limited, for the circulation will be sluggish.

As the subject of garage heating has not been treated recently in these columns ,it may be worth while to go into the matter a little more fully. Fig. 3 shows a method of heating which would be possible if local conditions permitted its use. Hot water, it will be seen, drawn from the plumbing fixtures in the house (with one exception) must first pass through the radiating surfaces in the garage. This insures heating in the garage, since relatively cold water drawn from hot water taps in the house would soon be noticed and attended to. Heaters should be of sufficient capacity to maintain hot water at the

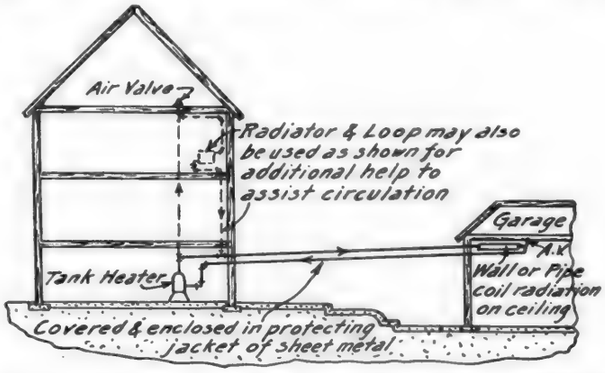

Air Valve
Radiator & Loop may also be used as shown for additional help to assist circulation
Garage
A.V.
Wall or Pipe coil radiation on ceiling
Tank Heater
Covered & enclosed in protecting jacket of sheet metal

FIG. 4—METHOD OF HEATING GARAGE WITH OVERHEAD RADIATION AND PIPING.

taps, in addition to heating the garage. If both heaters delivered hot water to a storage tank (with hot water flowing thence to the garage and afterward to the plumbing fixtures), more even results would be obtained. The runs to the garage could be valved off or by-passed, so as to cut off the garage in warm weather.

Where overhead outdoor pipe lines are not an objectionable feature the arrangement shown in Fig. 4 could be used. There might be some doubt as to quick and positive circulation, but this could be remedied by carrying a line of piping up to the top story.

Discussing the general subject of garage heating, a method

that has been used with success is shown in Fig. 5. This includes the use of a one-piece casting or heater having two separate chambers. In this casting, shown in detail in Fig. 6, the water circulating through the outer chamber is heated by steam or boiler water in the inner chamber, the latter being corrugated to give extended heating surface. The heater is made in four sizes and where steam at 5 lbs. pressure is used and the water heated from 45° during a 3-hour period, the tank capacities of each heater range from 40 to 400 gal. Fig. 5 shows the usual way in which this is installed, although it may be used for piping placed as in Fig. 4. As shown in the sketch, the device is connected to the residence boiler and the hot water pipes are run underground to the garage, using either city pressure, an expan-

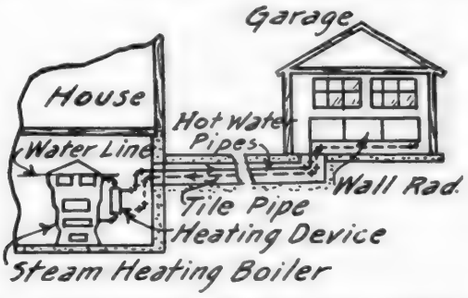


FIG. 5—HEATING GARAGE WITH HOT WATER BY MEANS OF SPECIAL FITTING ON STEAM BOILER.

sion tank in the house or garage, or loops. At least one heater is installed below the water-line of the boiler in the residence, and if additional capacity is required, it may be installed above the waterline, and live steam used to heat the water. This prevents freezing, since the heater below the water-line is always working, even though there is no steam in the boiler, or the fire is banked.

A method quite generally used for heating garages is shown in Fig. 7. The supply to the garage is carried up to the top floor, or highest point of the residence, before extending it across to the garage. Such a loop will, in many cases, increase the velocity of circulation fully 50%; in fact, for limited height between heater and garage radiation, this is the only way to secure substantial results. As another aid to circulation, the rising pipes and hot flow-pipe underground may always be covered, while the drop and, perhaps, also the return main, may be left bare. To

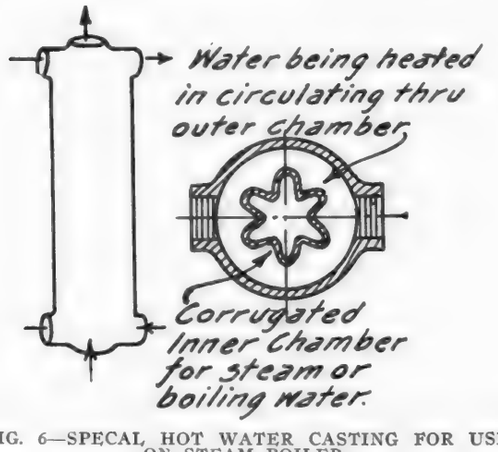


FIG. 6—SPECAL HOT WATER CASTING FOR USE ON STEAM BOILER.

further facilitate the combined installation, the down-feed system is used in the residence.

The cross-over should be thoroughly covered, particularly if laïd above the frost line.

The circulation can be still further improved by connecting a top floor radiator of at least 20 sq. ft. capacity to the drop riser, preferably, of course, at the top of the loop, as shown dotted in Fig. 7. The radiator cools the water descending in the drop riser which, by its greater density, increases the velocity of the circulation. Some heating men prefer this method, making it a rule that no house radiation shall be supplied by the garage mains unless such radiation be connected on the through-flow plan and at the top of the loop, if possible. If one or more radiators are connected in this manner, the water in the lower radiators will be slightly cooler than in the upper radiators, since it is tempered down by the discharge from the upper radiators. These lower radiators, together with those in the garage, may be increased in size, say, 10%. The above method, when used with several radiators, makes the circulation quite active. There should be no valves on through-flow radiators if their beneficial effect as accelerators is desired without interruption, although they may be by-passed and valved, if necessary, as shown in Fig. 8.

The two valves shown in Fig. 7, controlling the supply and return from the garage just inside the house wall, should have ⅛-in. or 3/16-in. holes drilled through the gates to maintain enough circulation to prevent freezing when garage line is shut off.

An expansion tank will give the required relief without the use of any special devices, unless a pressure system is used. In

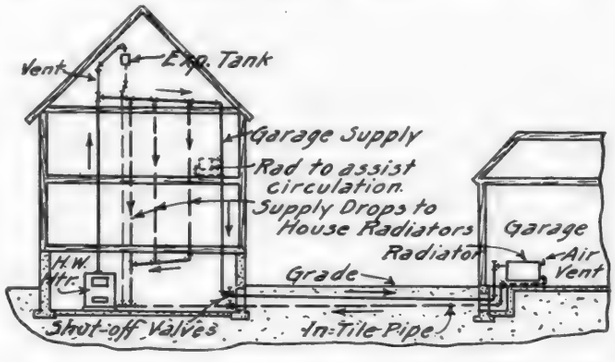


FIG. 7—HEATING GARAGE FROM DOWN FEED WATER HEATING SYSTEM IN RESIDENCE

such cases, an air chamber about 12-in. or 18-in. high and of pipe two or three sizes larger than the circulation line may be used as a receiver for air. A common air valve mounted on the cap on top of the pipe will serve to relieve the accumulated air from time to time. This, of course, is not automatic and the substitution of an automatic air vent, which relieves under pressure, might give better satisfaction.

For a small garage a water heating system is probably the best. There are several concerns which make small, self-contained and efficient garage-heating outfits, consisting of a small heater of the tank-heater type, with expansion tank, radiation and connections.

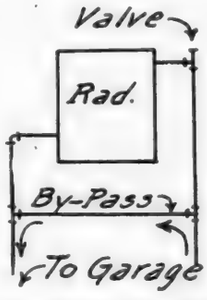
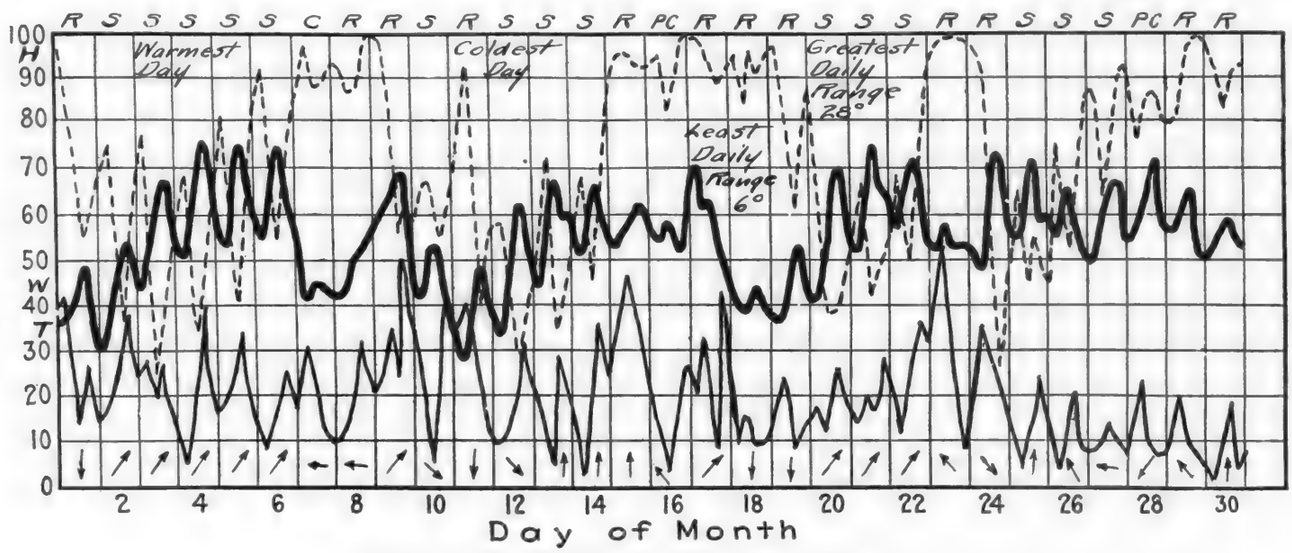


FIG. 8—PROPER CONNECTIONS FOR THROUGH-FLOW RADIATORS.

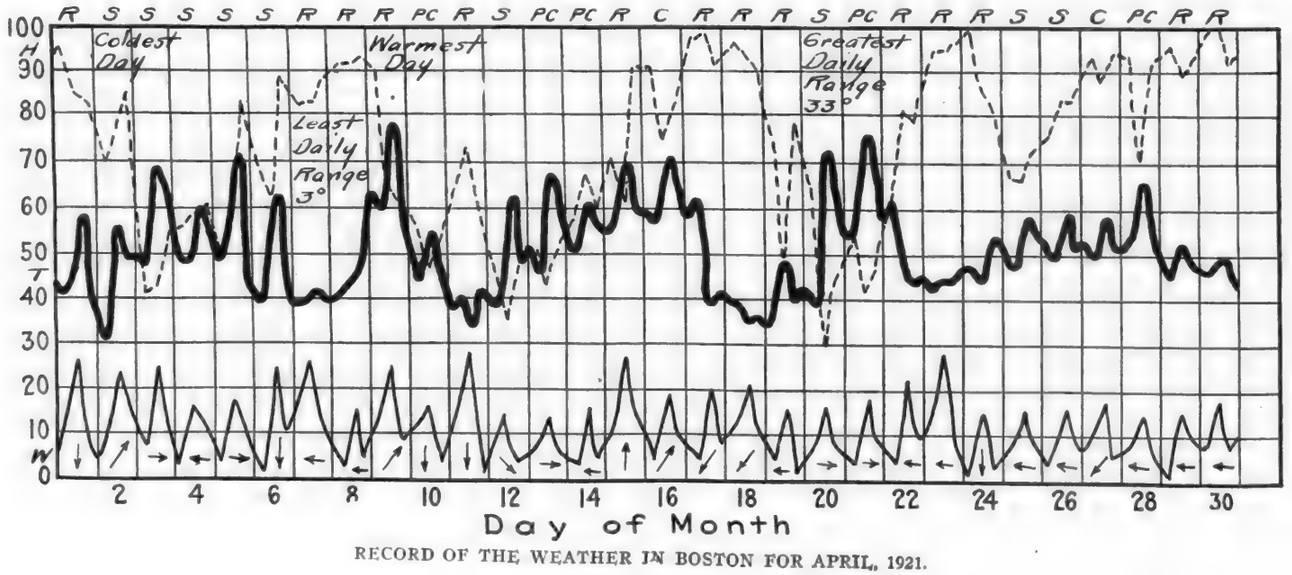
For a public garage, due to frequently-opened doors of large size and resulting exposure, steam is, without doubt, the best heating medium. It might be well to add that wall radiators should be placed sufficiently high to permit freedom of movement of cars, at least 2 or 3 ft. above the floor line.

THE WEATHER FOR APRIL, 1921

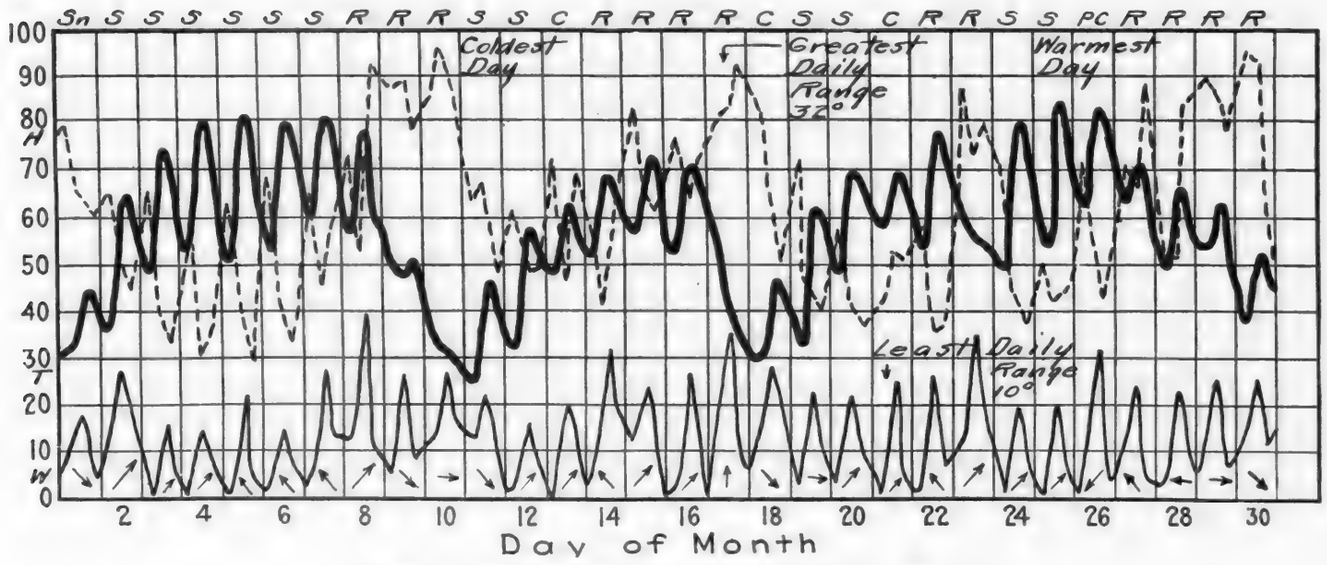
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F.	76	77	84	81	82
Date of highest temperature	4	9	25	24	25
Lowest temperature, degrees F.	28	32	26	28	30
Date of lowest temperature	11	2	11	10	17
Greatest daily range, degrees F.	28	33	32	29	30
Date of greatest daily range	20	20	17	2	12
Least daily range, degrees F.	6	3	10	5	8
Date of least daily range	18	7	21	16	22
Mean temp. for month, degrees F.	55.0	51.6	56.9	54.2	58.1
Normal mean temp. for month, deg. F.	48.1	45.3	51.0	45.9	55.8
Total rainfall, in.	2.88	4.62	1.66	4.47	7.01
Total snowfall, in.	0.1	none	0.6	0.4	none
Normal precipitation, this month, in.	3.30	3.55	2.90	2.88	3.52
Total wind movement, miles	11349.	6973.	7668.	11007.	11914.
Prevailing direction of wind	S.W.	E.	S.W.	N.E.	S.
Number of clear days	15	9	12	12	13
Number of partly cloudy days	11	7	4	4	4
Number of days on which rain fell	3	14	13	10	13
Number of days on which snow fell	1	none	1	4	none
Snow on ground at end of month, in.	none	none	none	none	none



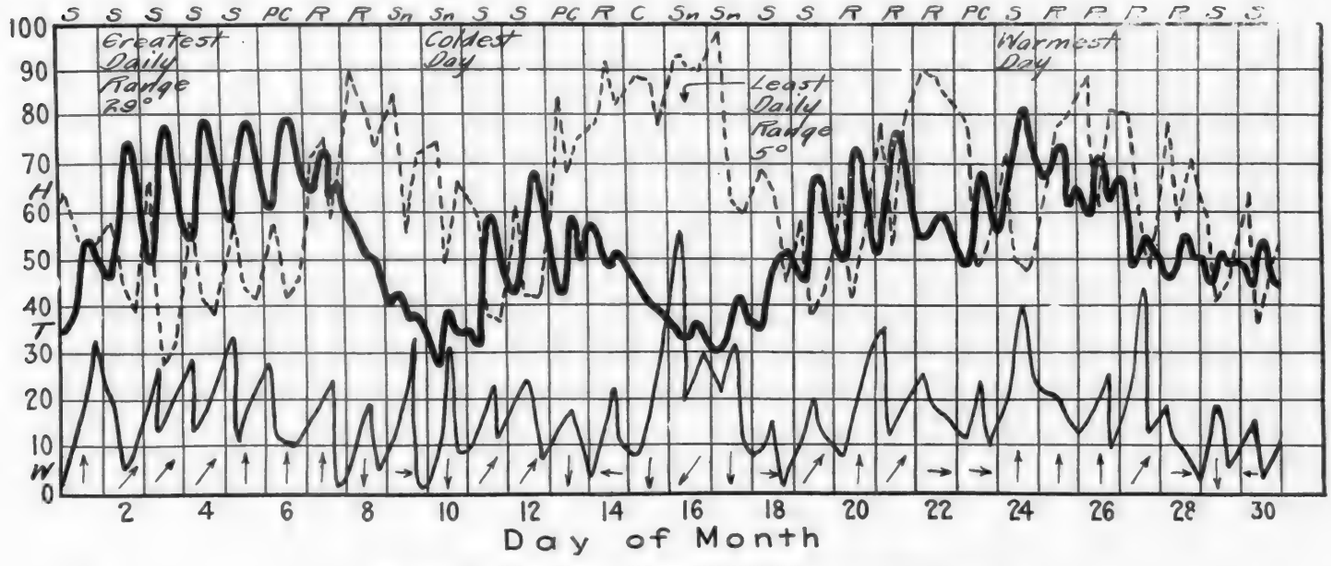
RECORD OF THE WEATHER IN NEW YORK FOR APRIL, 1921.
(Hourly Observations of Relative Humidity Plotted on this Chart.)



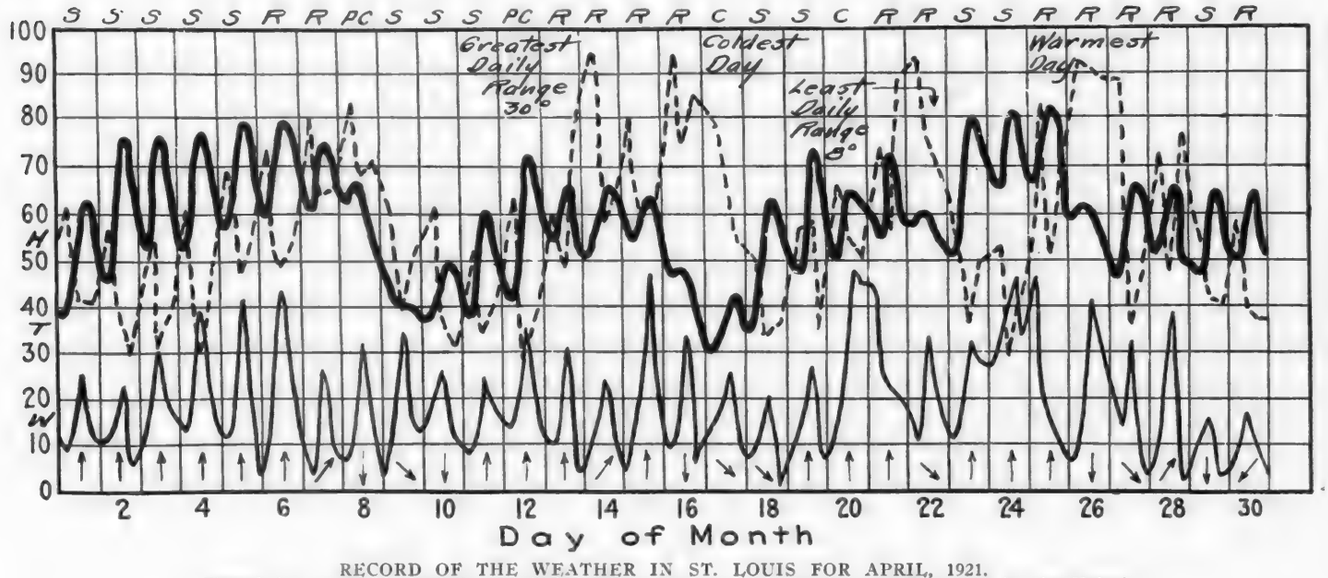
RECORD OF THE WEATHER IN BOSTON FOR APRIL, 1921.


Sn S S S S S S R R R S S C R R R R C S S C R R S S PC R R R R
Coldest Day
Greatest Daily Range 32°
Warmest Day
Least Daily Range 10°
H
T
W
Day of Month

RECORD OF THE WEATHER IN PITTSBURGH FOR APRIL, 1921.


S S S S S PC R R Sn Sn S S PC R C Sn Sn S S R R R PC S R R R R S S
Greatest Daily Range 29°
Coldest Day
Least Daily Range 5°
Warmest Day
H
T
W
Day of Month

RECORD OF THE WEATHER IN CHICAGO FOR APRIL, 1921.


S S S S S R R PC S S S PC R R R R C S S C R R S S R R R R S R
Greatest Daily Range 30°
Coldest Day
Least Daily Range 5°
Warmest Day
H
T
W
Day of Month

RECORD OF THE WEATHER IN ST. LOUIS FOR APRIL, 1921.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings taken at 8 A. M., 12 M., and 8 P. M...
S—Clear, P C—partly cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

CHATS WITH UNCLE BEN

Future Heating Plants

Uncle Ben was passing down the crowded aisle at the automobile show. He seemed in a contemplative state of mind, and was looking lots harder at the great trusses and lofty roof of the Coliseum than at the beautiful cars and captivating accessories all about. As we rested a while on the velvet cushions of a de luxe sedan, he started.

"Did you ever think about the days to come when coal gets scarce, and the natural gas will have been burned and all the oil will have been used up, and all the other sources of heat will have become so costly that people will have to be careful? You can bet that such a day will surely come, and that future generations will probably suffer good and plenty on account of the wastefulness of this generation. Maybe electricity from water power, and alcohol from vegetables grown during each summer will keep our descendants warm each winter, but it will be a harder job than we have now. We are burning up capital. Our descendants will have to live on income only. I do believe, though, that not the least important thing will be better judgment in building houses and in designing central heating plants.

"For instance, did it ever occur to you how silly we are to build house after house along a street, with all sides exposed to the cold, as well as the top? or to build as we do, rows of apartments with maybe 3-in. or 4-in. spaces between walls, exposed to the cold?

"We have our being in the summer in comfort, surrounded by luxuriant vegetation and adequate moisture and lovely sunshine. Then we change in winter to a life in closed houses, without moisture, without air movement, wearing heavy clothing indoors as well as out, and subject ourselves to great shock and temperature variation every time we leave the heated houses for the outer air. We build separate houses, with heat loss in every possible direction, heating them often from central stations with underground piping which loses as much in transit as is required to warm the buildings. We do without vegetation to a great extent, during the winter, living on stored food and a few hot-house vegetables, and satisfying our aesthetic senses by some hot-house posies.

"Now, why not cease being pikers, and why not go at this problem of heating and living in a broad way? Why not heat entire streets or cities, instead of just buildings? Why not save and get some good out of the heat radiated from our walls? Why, the down-town parts of all cities are proved to be many degrees warmer than the country, due to this wasted heat. I have often noticed myself, driving my old bus from the South Side through town to the North Side, how the snow will freeze to the wind-shield when I start way out at 49th street; will begin to loosen up at about 12th street, and will be like rain until I am up out of the tall building region, say at Chicago Avenue, where ice will begin to appear again.

"My dream of the future implies a vast building something like this Coliseum, spanning whole streets, covering buildings and gardens and factories—a glorified greenhouse. It will have double glass, with dead air space or vacuum which will discourage heat transmission by convection, but will not discourage radiation of the sun's heat. Heating will be a public service, just as furnishing water is a public service now. In summer there will be many openings in the roof, to give full advantage of the weather. In winter there will be no difficulty about ventilation. as the whole affair will tend to breathe naturally, like a chimney, due to its height. There will be a California climate all winter; our streets will be bordered with palms, fruit trees and roses, and pneumonia will be an obsolete disease."

I said, "all very pretty, Uncle Ben, but our civilization is what it is because of the invigoration given the race by its climate-bucking. Make things all soft and easy like you say and we will get soft and easy."

"Oh no," said he, "certain outside work must always be done. The outside will always be accessible to everyone in a few minutes, for sleigh-riding, ice skating, etc., but the young and tender or the old and infirm will not have to go outside, and anyone who does will prepare for the experience and will reap its fullest benefit. Instead of sitting or working all day in a 70° or 80° temperature, with woolen underwear so as to meet for a few minutes the cold outside, we will wear proper clothing whether inside our houses or out, and will only bnndle up when we leave the general enclosure. It's this inexcusably, unscientific method of dressing and the cooping up in little overheated rooms that brings up the casualty list the minute the windows go down every fall. In my scheme we will have so big a space, so teeming with vegetation state in all probability the air would be sufficient unto itself and would require little arbitrary changing. Of course, I am dreaming of something so far ahead that we will not have to consider the exhaust of motor cars, and one in which cooking will be done without the local combination of fuel. The cost will check up, I should say, better than the cost of heating this Coliseum checks with that of heating the buildings across the street from it. The structure I have in mind would be very much warmer than this Coliseum; would extend for miles; would have the heat given off by many activities such as transportaton and manufacturing, and I believe will lose not more than half as much heat per unit as this building loses."

"As a matter of curiosity, I figured the exposed surfaces on six buildings, placed 10 ft. aaprt, each 40 ft. high, 60 ft. long. It amounts to 62,400 sq. ft. A building could be built to cover all of these without exceeding their exposed surface, having a periphery of 208 ft. or, say, a building 100 ft. wide and 50 ft. high. I have neglected the ends of the large building, as it could be circular or would be so long as to render the factor of ends negligible. We would have over our six 40 x 60 x 40 ft. houses a compiete enclosure with 48 ft. to spare in front for yards and street, and 10 ft. on top for a roof garden. The greatest fredom and individuality of houses would be permissible, and their cost would be greatly reduced, since they would be summer homes without necessity of being even rain-proof. A new style of architecture particularly adapted to the conditions would doubtless be developed. Heating would probably be done with warm water, preferably not enclosed in pipes or radiators, but as fountains or showers. Fans might be used, especially to equalize the temperatures between floor and ceiling, and because everybody likes and needs air movement.

"We have some examples of the general scheme right here. Take an office building with an enclosed court. The court side is nearly always a pleasant place, the air is never bad. Why shouldn't the court be full of vegetation? The objection to enclosed court buildings seems to be that where they are lofty, the fire hazard becomes serious. A fire in some packing boxes on the third floor may make enough gas to put out everybody on the thirteenth floor. Of course, with my conservatory scheme we would have to keep this danger in mind, perhaps limiting the permissible height and arranging for many automatic vents for relieving the pressure and temperature following fire. Eliminating individual heating plants and direct combustion will, of course, greatly reduce fire.

"Snow on the roof will have to be scraped off. Great tanks of water for absorbing radiant heat from the sun and giving it off at night, while also supplying moisture, will doubtless be a part of the scheme. I suppose you know how some of the munitions factories which depended for efficiency on made-to-order climate, had as their roofs the bottoms of artificial lakes. The water would, in hot weather, absorb the radiant heat from the sun, changing much of it to work in the form of evaporation, rendering much easier the problem of air conditioning in the rooms underneath.

"Allowing ice to form outside my dream building may also be a factor in heat conservation, for the surest way to save a carload of oranges from freezing is to turn on the hose and sprinkle the outside of the car until it is coated with ice. A Canadian Northwest mounted policeman told me that when they had to make a long, cold ride they would encase their boots in burlap, then sprinkle with water until a coating of ice was formed, and that frozen feet inside this protection were rare. We all know that the winter wheat crop will be good if the snow and ice shall have been thick enough to protect it, and that the wheat is winter-killed otherwise."

Our wives were coming and our rest was ended. I have been thinking over what the old man said—after all, why not? I remember the huge circular court of one of the big southern Indiana hotels, with its seemingly good air, its vines and flowers and birds even in January.

When I think of the present very lively proposition of having milk and sugar declared public utilities, as being necessities the same as water, free to all who need them, the following query presents itself irresistibly: If water, a necessity, has been found a proper public utility, and milk and sugar ought to be, should not heat and housing be equally a proper public responsibility? I do not believe that this proposition borders on socialism, and do believe that its adoption will go far toward conserving natural resources. The lives of children and the good health of the race surely belong in the catalog of natural resources.

Efficiency of the Palmer Apparatus for Determining Dust in Air.

In connection with improvement of condition relating to the health of workers in the mining and metallurgical industries, the Bureau of Mines has co-operated with the U. S. Public Health Service in determining the amount of injurious dust suspended in the atmosphere. The three methods for dust determination most commonly used are: (1) Washing out the dust from a measured flow of air with a water spray, as in the Palmer apparatus. (2) Filtering out the dust from a measured flow of air with a water soluble granular medium, as in the sugar tube method. (3) Forcing a definite volume of air at high velocity through a small orifice against a coated glass plate to which the particles adhere so that they may be counted subsequently with the aid of a microscope. The Hill dust counter and the Konimeter depend on this principle. None of these methods is entirely satisfactory and all of them fail to include all the finer particles which are, when inhaled, the most injurious.

A critical study of the efficiency of these methods with respect to very fine particles seems very important especially as new means for making this study are now available in the methods developed for testing the effectiveness of gas masks and other protective devices against poisonous and irritating smokes.

The Palmer apparatus is completely built into a portable case. The washer consists of a large pear-shaped glass bulb with a "U" about 1 in. in diameter at the bottom; one side of the "U" is open to the air. Pure water to the amount of 40 cu. cm. is charged into it for a test; this amount causes the level in each arm of the "U" to rise ¼ in. above the point of separation. Air is drawn through the water by means of a small blower, operated by a direct-connected motor using power from lighting circuits. The rate of flow of the air is measured by a pitot tube and an inclined gauge, the scale being graduated in cubic feet per minute, ranging up to 6. The rate of flow is controlled by means of a sliding disc which closes the outlet from the blower.

To test the Palmer dust sampler, the pear-shaped glass bulb, which is the essential part, was removed from the case and connected into an apparatus for measuring its efficiency. Two methods of testing were employed. The first, was based on optical comparison of the light (Tyndall effect) from suspended matter in the streams of incoming and outgoing air; tobacco smoke and air suspended silica dust were used as testing mediums. The second method, was based on weighing the matter, which passed the washer, by catching it in the small light tube of a laboratory Cottrell precipitator and determining its gain in weight.

RESULTS OBTAINED.

The tests made in this manner showed that the Palmer apparatus removed not more than 13% of tobacco smoke from air, measured by the method based on light reflection. By the same method of measurement, silica dust, air floated and then filtered through cotton wool so that it was very finely divided, was removed to the extent of 30% when the suspension passed at the rate of 4 cu. ft. per minute,—and 20% at the rate of 3 cu. ft. per minute. On a weight basis, as determined with the Cottrell precipitator, 45% of the silica dust was removed by the Palmer apparatus at flow of 4 cu. ft. per minute. On a numerical basis, the efficiency must be considerably lower than the 30% efficiency found by the optical tests.—*S. H. Katz, E. S. Longfellow and A. C. Fieldner before the American Society of Heating and Ventilating Engineers.*

An Electrical Dust Removal Process.

The May issue of *The Travelers Standard* contains an interesting article descriptive of the Cottrell process of electrical precipitation of dust, smoke, and other finely-divided particles of matter from the air. Developed by Dr. Frederick G. Cottrell, former director of the Bureau of Mines, for the removal of dust from smelter stack discharge, the process has been applied successfully to a wide variety of industrial dust-precipitation problems.

While electrical precipitation of dust is not a new idea, the principle used in Dr. Cottrell's apparatus differs from that of previous investigators. If a needle or other fine metallic point, connected to a high potential direct-current line, be brought near a flat plate connected to the other end of the line, the air between the two electrified bodies becomes heavily charged with electricity having the same sign as that on the point. Particles in the air charged with electricity of one sign and free to move in any direction, will move at once toward the plate oppositely charged. In this way it is possible to precipitate dust and other matter from air moving at considerable velocities.

The practical device for applying this principle is formed by rolling up the flat plate into a cylinder of circular vertical cross-section and by extending the point to a line in the shape of a wire or chain passing through the cylinder along its axis of revolution. This provides a vertical flue through which can be passed the exhaust gas to be purified, with certainty that each particle of dust in it will come within the sphere of influence of the electrical discharge. Potentials of from 25,000 to 100,000 volts are used, the negative end of the circuit being attached to the wire or discharge electrode while the positive end is connected to the metallic cylinder or flue through which the gas must pass. A velocity of from five to ten feet per second is possible in the cylinder. The relation between cylinder dimensions, potential, and character of gas must be such that a good corona effect is secured without danger of arcing between the electrodes. Dust collected on the flue walls by this process is removed by rapping the flue which produces gravity discharge into a hopper below.

Worthy of notice is the fact that the patent rights on the invention have been transferred to the Research Corporation of New York, with the understanding that all profits accumulated over the needs of the company are to be contributed to the Smithsonian Institution or some other selected scientific or educational organization.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Program for the Summer Meeting at Cleveland, June 14-17.

The opening session of the Summer Meeting will convene at 2 p. m., June 14, at the Hotel Winton, Cleveland, O. Following the welcome address and the president's response, will be heard the annual reports of chapters, and the reports of the committees on chapters, code for testing heating systems, code for testing low-pressure heating, boilers, increase of membership, model chimney ordinance, and revision of constitution.

"Air Conditioning" will be the general topic of the second session at 9 a. m. on June 15, for which the following papers have been arranged:

"Resistance of Materials to the Flow of Air," by A. E. Stacey, Jr.

"Drying as an Air Conditioning Problem," by A. W. Lissauer.

"Rates of Drying" by Ray Power, U. S. Dept of Agriculture.

Papers to be presented at the "Heating" session on June 16 at 10 a. m. are as follows:

"By-Product Coke Ovens and Their Relation to Our Fuel Supply" by E. B. Elliott.

"Hot Water Heating in Asia Bank," by H. L. Alt.

"Circulation Problems in Hot-Water Heating," by A. W. Luck.

"Fractional Distribution in Two-Pipe Gravity Steam Heating Systems," by J. A. Donnelly.

"The Application of Gas to Space Heating," by Thompson King.

At 2 p. m. on the same date the "Ventilation" session will produce the following papers:

"Some Developments in Centrifugal Fan Design," by F. W. Bailey and A. A. Criqui.

"Plea for Better Distribution in Ventilation," by J. R. McColl.

"Ventilation in Metal Mines," by D. Harrington, U. S. Bureau of Mines.

The closing session at 10 a. m. on June 17, will be devoted to the general subject of "Research" and will start with the report of the Committee on Research after which the following papers will be presented:

"Apparatus for Testing Insulating Materials," by F. B. Rowley.

"Ventilation Tests of School Rooms at Minneapolis," by L. A. Scipio.

"Chimneys for House-Heating Boilers," by L. A. Scipio.

"Dust Standards," by S. H. Katz.

The session will close with a commentary by Dean Scipio on the paper by A. J. Wood and E. F. Grundhofer, entitled, "Report on Heat Transmission, Corkboard and Air Spaces."

Illinois Lifts Lid at Final Session.

Technology resigned the chair to melody at the closing session of the Illinois Chapter at the Chicago Engineers' Club on the evening of May 9. Following the usual acceptance of the minutes of the previous meeting, "as read," the program opened with a five-round bout in which the fifty-one members and guests drew a referee's decision over one of the best little menus of its class ever encountered. This victory was celebrated by piano and vocal selections representing a background of modern jazz pleasingly sprinkled with old time songs. To complete the evening a few of the more seasoned owls repaired to the billiard room to listen to the music of the spheres. In the absence of both President Hornung and Vice-President Claffey, John Howatt, past president of the chapter, took charge of the festivities.

Report of St. Louis School Tests To Be Presented at Heating Engineers' Summer Meeting.

Further details of the tests made recently in the Bryan Mullanphy School, in St. Louis, have been received from Edwin S. Hallett, chief engineer of the St. Louis Board of Education, who states that the results obtained will be presented in detail at the forthcoming meeting of the heating engineers' society, in Cleveland, June 14-16.

The program covered two days of activity on the part of the chapter members, the first day being devoted to visiting a number of schools, starting with the now famous O'Fallon School, in which the first experiments in connection with ozone in ventilation were made. The unanimous verdict, as expressed by principal and teachers, was that ozone is just as popular and necessary as it was the first year.

The next building visited was the Cleveland High School, which has one of the largest ventilating systems of any school in the country. The fans handle more than 300,000 cu. ft. of air per minute and a single air washer of nearly 100 ft. in length cleans up all this air.

The next stop was at the new Susan Buder School which is nearing completion. This school has many innovations in its heating and ventilating system. The engine-driven fan supplies the usual 30 cu. ft. of air per person through plenum chambers, with individual room mixing dampers, but all space not occupied by children is supplied through trunk ducts, with heat regulation at the room inlets. There are no individual room ducts for the vents, but all the exhausted air is taken to the attic and thence down a shaft to the apparatus room where it may be utilized in a number of ways. It may be passed through galvanized-iron exchanger pipes which cross the path of the incoming air. This will warm up the cold air to a degree at which the discharged air is equalized with it in temperature, or it may be passed through the ozone apparatus and washer and immediately returned to the rooms with but a slight loss of heat. The building, when completed, will be tested for ventilation.

The inspection trip was continued to the Mason School and Hamilton School, which are the St. Louis standard schools as to equipment, but each has many new ideas in connection with its equipment.

In the test of the Bryan Mullanphy School, which had been placed at the disposal of the St. Louis Chapter by the Commissioner of School Buildings of St. Louis, some 30 to 40 members of the chapter participated, under the direction of Acting Director L. A. Scipio of the Research Laboratory, and O. W. Armspach. The members were grouped in committees to make the several parts of the test as required with the synthetic air chart method.

Room 3 was selected by Mr. Armspach as best suiting his purpose for the test. Director Scipio directed the operation of the force. The tests were made in the forenoon without ozone and in the afternoon with ozone. The dust count slides and air samples for CO_2 determinations were shipped to Pittsburgh for examination. This test was made with all the vented air discharged, and with air washer, equipped with mist nozzles, in operation.

It was found desirable to have another test made with the air recirculated and with wet scrubbers and no mist nozzles. This test was conducted the following week, without the assistance of Messrs. Scipio and Armspach. The bacteria count was handled by Dr. James Stewart and four of his assistants in the Hygiene Department and the City Bacteriologist. The odor determination was also made by the physician of the Hygiene Department.

At the meeting of the chapter on the evening following the first test, many complimentary things were said of the St. Louis system of ventilation. It was noted that the bacteria count was lower in the afternoon with ozone than in the forenoon, and it appeared that the recirculating air was better than all new air. It was stated to be 100% free from odors.

New York Chapter Closes Season.

New York Chapter members and friends, to the number of 130 or more, turned out at the concluding meeting of the 1920-1921 season, at the Building Trades Club, May 16. All speeches, technical or otherwise, were "taboo" and the diners gave themselves up to an evening's enjoyment, furnished by the entertainment committee in the way of professional vaudeville talent. The meeting closed with all hands joined and singing "Auld Lang Syne." The committee which so successfully arranged the entertainment was composed of B. K. Strader, chairman; H. G. Issertell and L. L. Munier.

St. Louis Hears Discussion of the A. S. M. E. Boiler Code.

Robert F. Wiselogel was speaker of the evening at the May meeting of the St. Louis Chapter, held at the American Annex Hotel in St. Louis on May 12. His paper, entitled "A Discussion of the Uniform Boiler Code of the American Society of Mechanical Engineers," covered in a very complete way the history of the boiler code committee of the A. S. M. E. and showed that it will be an advantage to have each state adopt this code as its stand-

ard. Mr. Wiselogel stated that the two principal advantages of this code are: first, that it introduces rules and designs tending toward more durable product; and second, that it helps to safeguard the lives and property of the general public. He said that the Boiler Code has been adopted, thus far, in seventeen states and in four large cities located in states which have not yet approved it. It was also stated that this code has been made part of the instruction course in a number of prominent technical colleges.

Problems Facing the General Contractors.

It is significant of the situation in which the general contractors find themselves that at the recent annual meeting of the Associated General Contractors, in New Orleans, the formal program for the opening session was abandoned and the discussion of the present and future work of the association taken up instead. This included such topics as estimating, accounting, insurance classification, contract forms, legislation, jurisdictional disputes, codes, industrial relations, ethics, membership, research in materials, labor and transportation.

One of the principal addresses was delivered by Lawrence Mauran, a former president of the American Institute of Architects, in which he urged a co-fraternity of all construction interests, and the adoption of a fixed-fee form of contract.

There was a lively debate over the comparative merits of the fixed-fee and cost-plus forms of contracts. One of the points raised against the cost-plus form by Godfrey Edwards, of Los Angeles, Cal., referred to the advantages of this form to the Napoleons of construction.

"We must take into consideration," he declared, "the average-sized man. America is built up of such men. Of course, I realize that these Napoleons of construction who have made for themselves an enviable position in their cities can undoubtedly give value received on a percentage contract, and I am willing to admit that some of these very large concerns operating in Boston and New York can give an owner in their city, or perhaps in a city very closely neighboring it, good value for his money, but I deny and I am prepared to prove, if you want to go further into the matter, that such an institution can come out three thousand miles from his home office and perform a like service.

Twelfth Annual Convention of the National Pipe and Supplies Association.

The opening session of the annual convention of the National Pipe and Supplies Association at the Hollenden Hotel, Cleveland, O., on May 10, was marked by the presence of a large and enthusiastic gathering of members, guests, and manufacturers in this field. Following the lead of President George V. Denny, a number of speakers favored the assemblage with optimistic views on the future of the industry. Among those who addressed the morning session were Leslie Johnson, A. M. Byers Co., Pittsburgh, Pa.; A. I. Fisher, Glauber Brass Mfg. Co., Cleveland, O.; T. R. Barnes, Barnes Mfg. Co., Mansfield, O.; W. E. Manning, Youngstown Sheet & Tube Co., Youngstown, O.; John J. Kennedy, National Tube Co.; William Byrd, Hammond-Byrd Co., Birmingham, Ala.; Charles K. Foster, American Radiator Co.; A. M. Maddock, Thomas Maddock's Sons Co., Trenton, N. J.; and John D. Buckley, Jenkins Bros., New York. The evening session on the first day was taken up by a paper on "Previous Changes in Price Levels and the Probable Results of This One," delivered by Leonard P. Ayers, vice-president of the Cleveland Trust Company. Mr. Ayers emphasized the need for more accurate knowledge of price movements, pointing out that until this is available periods of high prices should be zones of cautious trading and periods of low prices, zones of courageous trading. He showed also the fact that all countries are economically interdependent.

C. C. Parlin, manager of the commercial research department of the Curtis Publishing Company, opened the morning session on May 11 with a paper on "Effects of Changing Business Conditions on Sales and Advertising Policies." The two factors in any market, as explained by Mr. Parlin, are buying power, or the ability to buy, and the willingness to buy. He believes that there exists in this country at present plenty of buying power, but at the same time a general unwillingness to buy. He believes that the advent of prohibition has greatly increased the buying power of the country and that the present readjustment period will be very much shorter than the twelve years required for readjustment after the Civil War. Parts of Mr. Parlin's address might be construed to indicate a belief in advertising, which is perfectly natural under the circumstances. The afternoon session on the second day was opened by W. J. Woolley, manager of the National Trade Extension Bureau, who spoke at length on the history and methods of the Bureau and the results already obtained.

The following officers were elected for the ensuing year: President, Guilford R. Adams, Samuel Sloan & Co., Rochester, N. Y.; first vice-president, W. E. Clow, Jr., James B. Clow & Sons, Chicago, Ill.; second vice-president, L. J. Merkel, Merkel Bros. Co., Cincinnati, O.

How to Meet the Crisis in the Building Industry.

Suggestions for meeting the situation caused by the stagnation in the building industry and including many of the ideas developed at the recent Philadelphia Conference of the Building Industries, are contained in an article by D. Knickerbacker Boyd which appeared in the April *Bulletin* of the Master Builders' Exchange of Philadelphia. While the Philadelphia conditions are specifically mentioned in this discussion, many of the problems and conditions are nation-wide in extent and the suggestions, therefore, are of general interest. Mr. Boyd says:

"The first and foremost need in the Philadelphia building situation is a real co-operation that should include everybody connected with the construction industry. A group, congress or tribunal should be organized at once in this city to consider all the problems connected with building and related construction as we ought to get under action without delay. Mentioning them in their order of appearance on the scene, the group would include realtors, architects, engineers, builders, sub-contractors, material men, working men, and the final owners or tenants.

"The prices of materials and the wages of labor should first be stabilized on a sound and fair basis. The wages of workingmen should be worked out not by them alone, but by the group in unison and all wages should bear a proper relation to one another, taking into fullest consideration the periods of unemployment in each building trade during an entire year as well as the required training and the acquired skill.

"The easiest way to overcome the great amount of unemployment in the building trades would be to so arrange it that employment would be nearly continuous. That would mean a building construction program that would be carried on as far as possible throughout the entire year. We should not allow such a condition to exist longer as has prevailed up until the present moment, when, after the first of November or December, there is nothing doing until after the following March or April. This has been largely a psychological condition and is a great and vital mistake in the building industry, one which makes for unemployment, holds back construction, decreases the productivity of labor and reflects upon American industry.

"We should all get together and discuss these problems and do it at once so as to be able to say to the consuming public, 'These are the prices of materials, and these are the wages which will prevail—not next May, but now!' And for the future, I suggest that such matters be taken up by the first of November or the first of December, so that a building construction program can be drawn up applicable to the next calendar year and advantage taken of the fair weather of all winter months. If we do this, it will be possible to decrease the cost of production from every standpoint. It is not generally realized that the working men in the building industry do not get what they seem to get, namely, a certain rate per hour, since that rate must take care of the enforced periods of unemployment that actually exist during each year in most of the trades.

"The periods of unemployment are not caused solely by weather conditions which, however, are the chief contribution factors. Some others are the lack of co-ordination of structural facilities and lack of co-operation between all those engaged in building.

"These causes are due largely to archaic methods, poor management and scheduling of work, materials not being available when needed, lost time in waiting from

either cause, men looking for work while employers are looking for men, sympathetic strikes, and others.

"Unemployment is one of the discouraging demands which keeps new men from entering the trades and is driving experienced men into steadier occupations who should have every encouragement to stick building.

"I offer the following suggestions for consideration in connection with the problem of unemployment.

"That the group referred to should act as a central bureau through which, voluntarily, all construction programs should be cleared including national, state, municipal, and private work in this territory. Suggestions could be made for co-ordination of activities, allocation of materials, and reduction of estimating costs. Local production could be encouraged, rail hauls shortened, traffic congestion lessened, a constant labor survey could be maintained to the advantage of employer as well as employee, good management promoted, efficiency encouraged, apprentices attracted to the trades, educated and properly trained and increased production would result all round.

"In such a program our vital necessity is also to educate the public to a sensible distribution throughout the year, of its construction demands and requirements. This applies equally to city work, industrial construction, semi-public buildings, residences and household repairs and maintenance.

"Instead of crowding our main construction work into seven or eight months that which could possibly be deferred and done during the remaining five months should be so scheduled.

"Owners making interior alterations or slight additions to buildings should be encouraged to have such work done in the 'off-peak' season. Old buildings demolished to make way for new ones should be torn down in cold weather in advance of the new construction without being done as is so often the case at the time when the new building itself ought to be under way.

"Existing office buildings, commercial establishments and similar structures should be painted outside and refinished inside at times when painters are least busy on new work.

"The same argument applies to the paper hanging and refinishing of apartment houses where another element enters, namely the termination of leases. It has even been suggested to realtors that the leases be staggered in dates instead of falling with such unanimity on October 1 of each year.

"Householders, instead of having spring housecleanings or fall housecleanings, would find it advantageous to be more constantly and less periodically "cleaned' so that paper hanging, painting, plastering and other needful work could fall on the workers like the gentle steady rain instead of in downpours with subsequent dry spells. Wiring of old residences for electricity might well be done in January, February and March when electricians are usually out of work on new construction.

"Surveys should be made of all structural requirements of Philadelphia and vicinity and of all trade conditions of unemployment and the two fitted together in the very best manner possible. It will be necessary, as stated, to educate and inform the public as to the needs and advantages of its co-operation in such a program. Civic clubs and others will afford good forums and it may be advisable to advertise. Certainly the necessities of the occasion must be forcibly and frequently presented. The public will surely respond.

"After it overcomes some prejudices and breaks some habits it will place orders with the heating contractors in the spring to have its apparatus and flues attended to 'some time' during the summer instead of waiting until the last moment in the fall.

"The public will appreciate having its attention forcibly called to the fact that by complying wih common-sense requirements, if not with ordinances, and having covered metal containers for the ashes from every household it will afford employment to the metal workers in their off building season, while at the same time lessening fire and life losses, street litter and disease.

"Other instances might be cited applicable to the carpenter, the slate roofer, the stone cutter and other trades, the most difficult to provide with off peak employment being the bricklayer. But through proper co-ordination of public and private construction, scheduling of interior work, sewer construction, boiler setting and other vocational opportunities his, with all the other trades, can be greatly benefited.

"Let us hope, at any rate, that intelligent and intensive study of the whole building industry may soon be undertaken not only locally, but nationally."

HUMIDIFYING DEVICES FOR THE HOME

No. 4—Eureka Humidifier

According to the old saying, there is more than one way to skin a cat. The Eureka humidifier skins the cat back of the radiator, instead of on top or between the coils. In so doing it secures the combined advantages of being quickly and easily detachable and at the same time entirely unobtrusive. The construction of the Eureka is simplicity itself. An oblong tank to hold the water supply contains the vertical flat slab of "vapor stone" which serves to raise water from the tank by capillary action and release it into the room by evaporation. The complete outfit is slung back of the radiator, supported by the two curved arms which fit into the spaces between radiator sections. A curved metal funnel attachment permits refilling of the pan without disturbing it and without spilling water on the floor or spattering the wall. The evaporation from this device is stated to be a quart or two of water per day. Two sizes are made, No. 1 being 10 x 12 in. and No. 2 measuring 10 x 14 in. The accompanying illustration shows how this apparatus looks. It is made by the Eureka Blotter Bath Company, of Chicago.

FIG. 1—EUREKA HUMIDIFIER, FRONT VIEW.

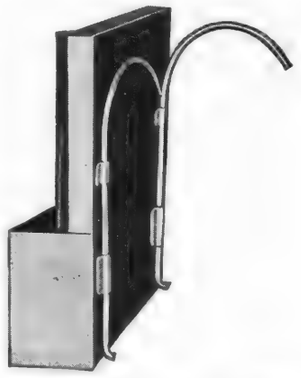
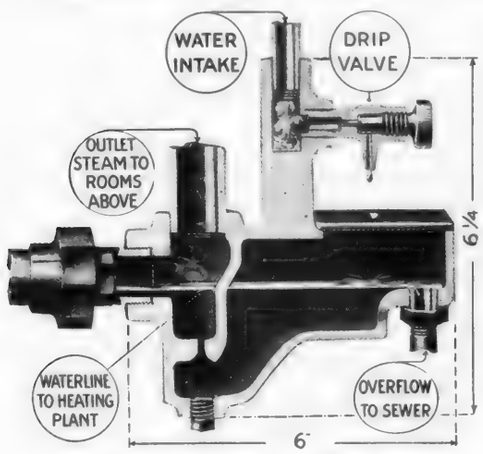


FIG 2—REAR VIEW, EUREKA HUMIDIFIER.

No. 5—Onward Air Moistener

Humidification of interiors by feeding to them supplies of steam vapor at atmospheric pressure, is accomplished by the Onward Air Moistener, illustrated herewith. Its operation is less complicated than the structure of the casting might imply. An adjustable drip on the water intake permits regulation of the amount of water to be fed to the system. This drip falls through a hole in the top of the casting and into a reservoir in the same to the sewer. The casting serves also which is drained by an overflow pipe as a trap for solid impurities, gravel, etc., which can be removed at intervals through the cleaning vent by removal of the plug. From this reservoir water is fed to a steam generator (not shown) that is located within the furnace, or boiler, or other heating unit. Steam is piped to the rooms where humidity is required and fed to them through floor registers or through humidifying outlets attached to the regular radiators.

There is no possibility of explosion with this device. since by no chance can any considerable steam pressure be generated. The use of this apparatus obviously remove all necessity for attendance, filling of radiator pans, etc., the only attention required being the adjustment of the drip valve to supply the desired flow of water. Since the need for artificial humidification increases with the rate of operating the heating plant, it would seem as if regulation of this device would be

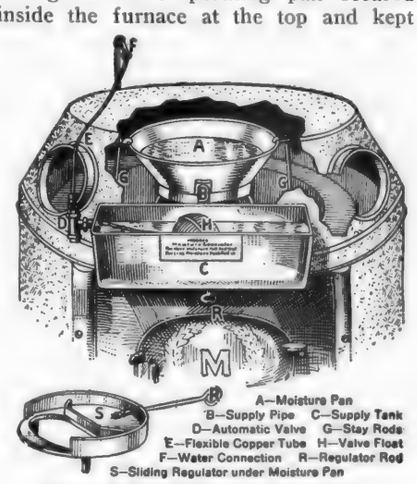


SECTIONAL VIEW, ONWARD AIR MOISTENER.

automatic in respect to its evaporating rate. The apparatus is made in two sizes by the Onward Manufacturing Company, Menasha, Wis.

No. 6 Moore Moisture Generator

While most of the humidifying devices previously shown, have been designed for use in connection with water or steam radiators, the Moore moisture generator is intended specially for use with the Moore warm air furnace as shown in the accompanying illustration. The apparatus can be briefly described as consisting of an evaporating pan secured inside the furnace at the top and kept


A—Moisture Pan
B—Supply Pipe C—Supply Tank
D—Automatic Valve G—Stay Rods
E—Flexible Copper Tube H—Valve Float
F—Water Connection R—Regulator Rod
S—Sliding Regulator under Moisture Pan

MOORE MOISTURE GENERATOR.

supplied with water from a supply tank outside the furnace. This supply tank is in turn fed from the water supply main through an automatic valve equipped with a float similar to that of a flushing tank. The Moore moisture generator is made of cast-iron throughout, by the Moore Bros. Company, Joliet, Ill.

What is the Country's Condition?

A survey by the Fidelity and Deposit Company of Maryland was recently summarized in the New York press in a page of statistics, representing the general opinions of one thousand selected representatives of the company in all parts of the United States. The questions were grouped, in this summary, under the heads of Industrial, Financial, Agricultural, and General. Of particular interest to the heating industry are the following question and the answers indicated:

"Is there a marked resumption of industrial activity?"—to which the answer "No' 'is attributed to all fourteen districts listed.

"Are raw materials plentiful?" —to which all districts are listed as answersing "Yes."

"Are building operations increasing or decreasing?"—to which the answer "Decreasing" is listed for the New England and Mountain sections and "Increasing" for all other sections of the country.

"Is there need of building construction and in what class?"—to which the answer "Yes" is listed for every section and low priced dwellings are mentioned by every one as one of the classes needed.

"What is the big local question in your community?"—to which the answer "Housing shortage" is included in replies listed for each section except the South Central and Mountain sections.

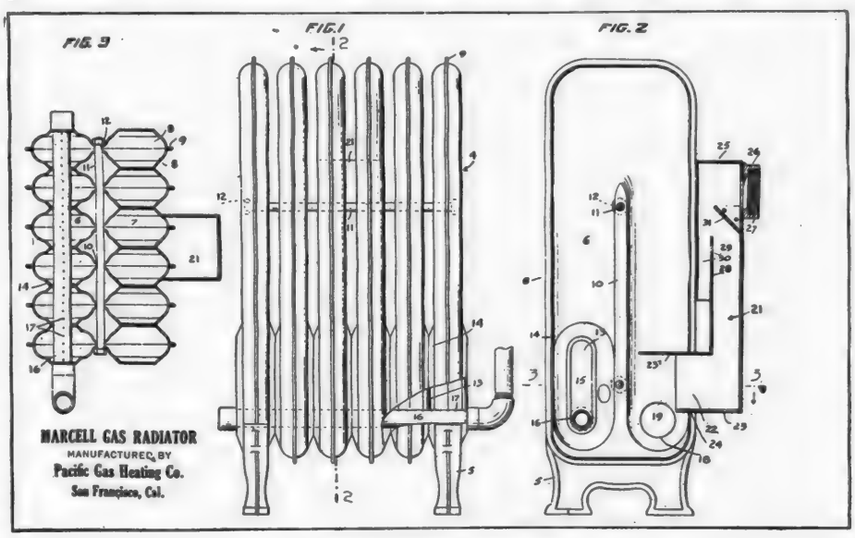
It is a mark of distinction for the Fidelity and Deposit Company of Maryland that it should have taken the initiative in making national condition surveys of this character—this being the second of its kind for which this company has been sponsor. The company is to be complimented for its public spirit in performing a function which should be handled by the government itself, and probably will be so handled when the advantage of such summarized opinion has been demonstrated.

For the reader of this class of survey, some of the points to be considered are: by what agency the survey is made; the special interests which this agency may have or represent; the manner of selecting the collectors of information; the collection methods; the sources of opinion represented by the survey; the various constructions which might be placed upon questions asked; and the weight of numbers represented by the several sections into which the listings are divided. Eliminating the matter of intentional coloring of the returns for the purpose of creating an artificial public opinion, there are a number of ways in which a survey of this character, carried on in entire good faith and sincerity, can fail to get the information it aims to get and can fail to secure the accuracy of interpretation for which it strives. It is only by making such surveys and learning the practical as well as the theoretical phases of the work that increasing accuracy of results can be achieved.

New Apparatus and Appliances

Marcell Gas Radiator

The result accomplished by the Marcell gas radiator, shown in the accompanying view, is to develop a gas heater into the apparent form of a steam or water radiator. In the design shown, a two column radiator is used, the row of gas burners extending longitudinally along the bottoms of the front columns and heating air which passes up the front column and down the back column of each section, and exhausts to the atmosphere, or to a flue, from the back of the radiator.



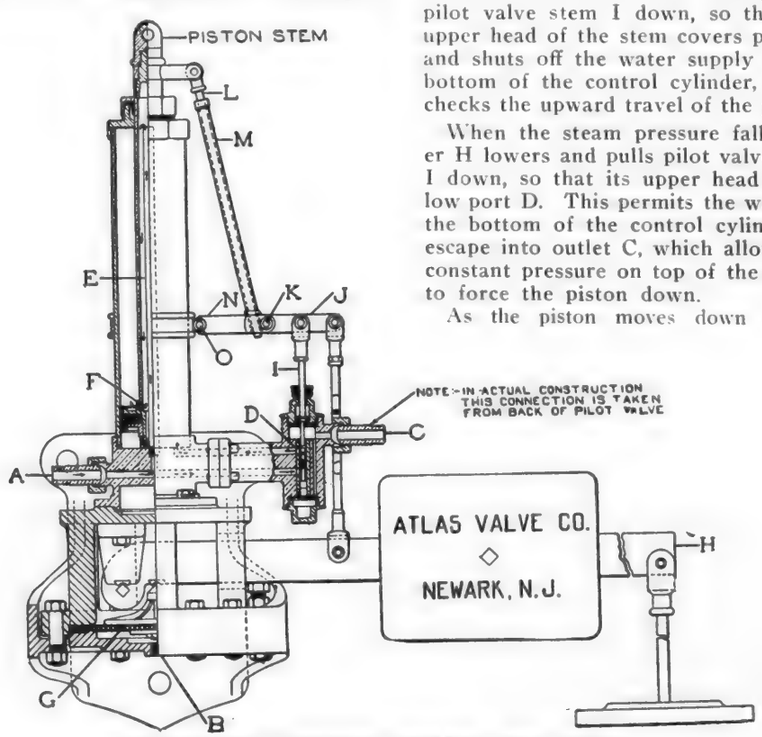
MARCEL GAS RADIATOR.

One of the features of this design is the fact that it can be made up readily into as many sections as my be desired. It is being marketed by the Pacific Gas Heating Company, San Francisco, Cal.

A New High Pressure Damper Regulator

A new hydraulically operated damper regulator, suitable for boiler pressure up to 250 lbs. has recently been developed by the Atlas Valve Company, Newark, New Jersey. It is designed to automatically regulate the steam pressure on high pressure power boilers.

The accompanying cross-sectional view of this regulator shows all details. The operating water, under pressure, enters the regulator through the inlet A and passes to the pilot valve, then to the bottom of the control cylinder through port D. It also passes to the control cylinder on top of the piston through pipe E into the hollow piston stem and into the control cylinder through holes F.



ATLAS HIGH PRESSURE DAMPER REGULATOR.

Pilot valve stem I is of spool form with the upper head passing over port D, which when above the port permits the water to pass into the bottom of the cylinder, and when below the port permits the water to escape from the bottom of the cylinder into outlet C.

The area of the top of this piston is reduced by an amount equal to the cross-sectional area of the piston stem, whereas the area of the bottom of the piston is larger. We therefore have two opposing forces pushing against opposite sides of the piston, the constant pressure acting against the lesser area on top of the piston tending to force it down and the variable pressure from the pilot valve tending to push it up. Therefore when pressure is admitted to the bottom of the cylinder the piston is forced up, and when the pressure is permitted to escape from the bottom of the cylinder the constant pressure forces it down.

When the steam pressure under diaphragm G, is sufficient to raise lever H, the pilot valve stem I, is pulled up by lever J, swinging on axis K, this permits the water to pass into the bottom of the control cylinder and force the piston up.

As the piston moves up, rod L is pulled upward in sleeve M, which is rigidly attached to lever N, swinging on axis O. As the point where rod L is attached to the piston stem travels in a straight line, the angle at which sleeve M stands is lengthened and to meet this longer angle sleeve M must swing outward, which depresses axis K on the end of lever N. This pushes pilot valve stem I down, so that the upper head of the stem covers port D, and shuts off the water supply to the bottom of the control cylinder, which checks the upward travel of the piston.

When the steam pressure falls, lever H lowers and pulls pilot valve stem I down, so that its upper head is below port D. This permits the water in the bottom of the control cylinder to escape into outlet C, which allows the constant pressure on top of the piston to force the piston down.

As the piston moves down rod L sliding into sleeve M, shortens the angle at which sleeve M stands and to meet this shortened angle, sleeve M must swing inward, which raises axis K, and pulls pilot valve stem I up so that the upper head of the stem covers port D, and shuts off the water discharge from the bottom of the cylinder, which checks the downward travel of the piston.

The importance of the compensating attachment cannot be overestimated since it acts as an intermediary medium to counteract the movement transmitted to the pilot valve by the steam pressure under the diaphragm, which balances the position of the damper on intermediate pressure changes, and permits the damper to be fully opened or closed only on extreme boiler pressure variations.

"U. W." Steam Trap.

It is our theory that in the life of every heating engineer there comes a time, sooner or later, when he invents a new steam trap. We hold this to be a mild form of disease, like chicken-pox and calf-love, from which most of the victims quickly recover without serious after effects. However, in some cases the malady seems to strike in and the sufferer undergoes a slow metamorphosis from a heating engineer into a manufacturer of steam traps. That this ailment is international in its scope and virulence is attested by the receipt of the following letter:

No. 21—3 Chome
Uramonzencho,
Nakaku,
Nagoya, Japan.

Heating and Ventilating Magazine,
Gentlemen:

I have your printed post card in regard to the Steam Trap patented at Patent Office of United States, Patent No. 1,338,541. In response of same we herewith enclose a pamphlet describing and illustrating same by which you will note the superiority of these steam traps. Also if you wish to have more detailed descriptions you will please refer to your patent office.

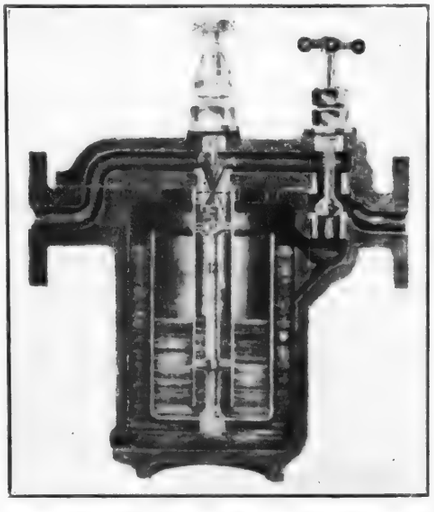
In you have any inquiry on these traps we shall always be glad to have them referred to us. We will quote you our best export prices immediately.

Thanking you in advance for your favor with valued inquiry, we are,
Dear sirs,

Yours very truly,

WASHINO CO. NAGOYA,
Per U. Washino.

5/2/21



SECTIONAL VIEW OF THE U. W. STEAM TRAP.

From this note it is evident that Mr. Washino is up on Wallace Irwin as well as the accepted catalog style of the American copywriter. At that we doubt the ability of most of our readers to do as well in Japanese. Of our own powers in the same direction, however, we have no doubt. We know. The sectional view of this steam trap

is herewith presented and left to the reader to translate for himself. In the pamphlet above mentioned there are offered arguments in favor of this steam trap in which we can find no logical flaws. Scarcity of fuel in Japan is emphasized in the accompanying table by the fact that coal is there measured in inches and fuel economy calculated on a monthly basis. We

寸法	節約量
3/8"	278 斤
1/2"	291
3/4"	319
1"	354
1 1/4"	395
1 1/2"	445
1 3/4"	514
2"	602
2 1/2"	725
3"	916

ECONOMY OF COAL PER MONTH

◎節約シ得ル一ヶ月ノ石炭ノ料

實地試驗の結果石炭にて「スチーム」壓力三〇ー九五封度迄の時一ヶ月連續使用の場合の石炭節約量を示す

FUEL CONSERVATION FROM AN EASTERN ANGLE.

hope that Mr. Washino will sell a great many steam traps as a reward for his courtesy in supplying this interesting information.

New Publications

TRANSPORTATION, THE PROBLEM OF SOFT COAL is the title of a pamphlet recently issued by the National Coal Association, Washington, D. C. The message of this publicity is to the effect that "to obtain even distribution of output so the railroads will not be jammed under strain of unusual demand, is the outstanding factor in the bituminous industry's effort to meet the nation's coal needs." This booklet treats of the several main factors relating to the fuel and the transportation problems of the nation. It was issued as press publicity and it is worthy of special mention for the fact that by printing on one side only of each page, the process of utilization as press publicity was greatly facilitated. The editor of this pamphlet has accomplished for his confreres of the press, everything possible except the making up of the editorial mind and the wielding of the editorial scissors and mucilage brush. We were strongly tempted to wield these for ourself and doubtless would have done so—had space permitted—as much for the purpose of rewarding merit as for that of spreading propaganda.

OPERATING A HOME HEATING PLANT, by A. M. Daniels, is a government publication recently issued, covering the general requirements for operation of warm air furnaces. The heads under which this subject is treated are: requirements for satisfactory heating; the chimney flue; selection and installation of heating equipment; understanding the heater and operating it intelligently; weather-tight houses essential to economical operation of a heating plant; humidity; and ventilation requirements. The booklet is well illustrated. It is issued by the U. S. Department of Agriculture as Farmers' Bulletin 1194. The author is assistant mechanical engineer for the Division of Agricultural Engineering, Bureau of Public Roads, Washington, D. C.

ANALYSIS OF IOWA COALS, by George A. Rice, A. C. Fieldner, and F. D. Osgood, containing data regarding the analysis and heating qualities of numerous coals from the various producing counties of the State, has just been issued by the Bureau of Mines (Technical Paper 269). The bulletin should be of interest to manufacturers, railroads, public utility plants and other large users of coal in Iowa and Nearby States. It is the first in the series of similar bulletins relating to the qualities of the coals of the different states. The report states, among other things that for domestic purposes Iowa coal makes a smoky fire, but is satisfactory when burned in lump or nut size. The small screenings and slack are largely used in power-house boiler plants.

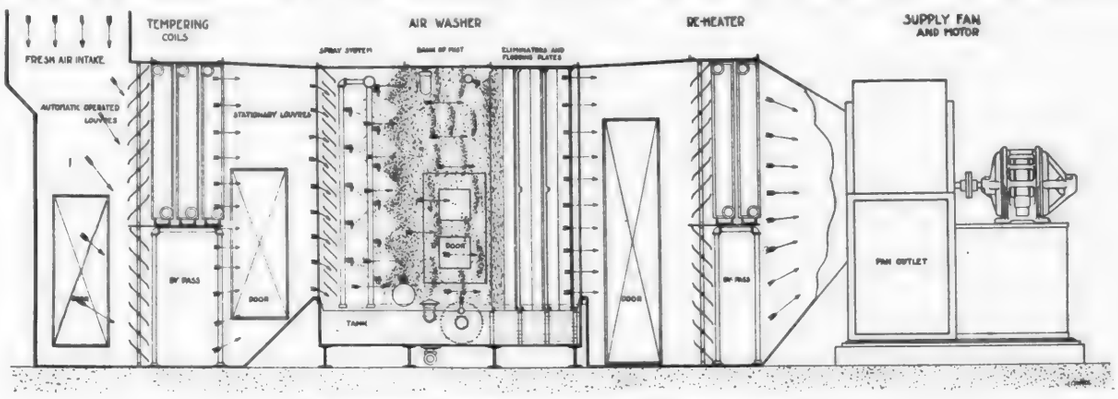
Trade Literature

RIVERSIDE-STACK INDIRECT WATER HEATER. manufactured by the Stack Division Riverside Boiler Works, Inc., Cambridge, Mass., is described in a recent folder issued by that concern under the name of the device. The apparatus consists of a cylindrical casing enclosing a heating element made up of vertical copper tubes. Steam or water from the heating boiler is admitted to the casing and serves to heat the domestic water supply by conduction through the copper tubes . Various methods of connection are illustrated in this folder. Size 3½ x 6¼ in. Pp. 14.

MEL-ROCK AIR WASHERS find complete

RIVERSIDE-STACK INDIRECT WATER HEATER.

explanation and illustration in Bulletin 10-A of the Mellish-Hayward Company, Chicago, Ill. Special points to which this concern draws attention in its pamphlet are its mist nozzzle design and arrangement, and the construction features of intake louvres, eliminators, and casing. The humidification process is not handled by the air washer apparatus as described in this pamphlet, but by an auxiliary humidifying device described in other literature of the company. It is explained that this arrangement secures better humidity results. Atomization of the wash water is secured by means of a spiral discharge nozzle rather than by the older method of high pressure and an obstructed nozzle. This seems to correspond with the practice of oil burner manufacturers who face a somewhat similar mechanical problem al-



MEL-ROCK AIR CONDITIONING APPARATUS.

though its objects are quite different. By means of copious illustrations and a lavish use of white space a very attractive pamphlet is secured. Specification forms, covering the various points in air conditioning, serve to make the pamphlet useful as well as ornamental. Size 9 x 12 in. Pp. 24.

UEHLING INSTRUMENTS stop fuel waste, according to a recent folder of the Uehling Instrument Co., New York, which depicts the waste in a lurid picture of smoke and flame—probably a cross-section of Pittsburgh on a quiet day, the difference being that on a busy day in Pittsburgh there is no flame visible. The instrument in question is a CO_2 recorder and on the folder is recited a list of various companies using this device to save fuel. This folder gets by. Size 5 x 7 in. Single page.

CONNERSVILLE VACUUM CLEANERS are suggested in a series of folders recently issued by the United Vacuum Appliance Division of Landers, Frary & Clark, Connersville, Ind. One of these points out the advantages of this apparatus for home use, another, its value for use in hotels and office buildings, and the third, its applicability to the cleaning problem in schools and institutions. Each of these folders is printed in colors and gives, in addition to description of the special facilities for the particular service in question, illustrations of the apparatus and of Connersville-equipped buildings. Dealers will no doubt find these folders effective in stimulating their vacuum cleaner sales. Size 3½ x 6¼ in. Pp. 8, each folder.

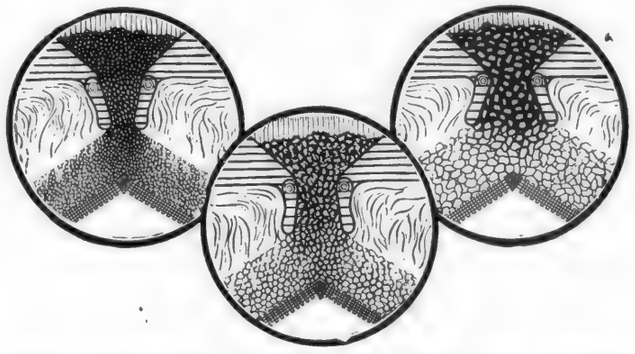
A BETTER SUMMER BUSINESS, printed in bold letters on the front page of its latest catalog, is the slogan with which the Monsoon Cooling System, Inc., of New York, tears away the veil enshrouding the business future. The appeal is addressed exclusively to the theatre proprietor and opens with the promise "How to make your theatre PAY—every summer." Unquestionably many theatre owners need advice on proper ventilating methods and equipment, but we have serious doubts that they need any advice on how to make their theatres pay, summer or winter. At any rate, the burden of argument favors the principle that air motion serves to produce increased comfort during hot weather. This fact is used as a basis upon which to urge the merits of the Monsoon cooling system as a source of air motion. The rest of the pamphlet is devoted to explanation of how the system works, accompanied by illustrations of both how and where it works. Size 6½ x 8¾ in. Pp. 32.

FIVE FACTORS IN HEATING COSTS are described in the latest pamphlet of the Grinnell Company, Inc., New York. According to this pamphlet the five factors are expense of operation, adaptability, maintenance expense, depreciation, and initial investment. The pamphlet favors the Grinnell System of hot water heating over any other system which has yet come to the attention of its writer. The reasons for this preference are explained in the development of the five factors above mentioned. Numerous diagrams and views interior and exterior help to make the pamphlet attractive. Size 7¾ x 10⅜ in. Pp. 28.

HAYNES AUTOMATIC VALVE, for use in connection with the Haynes humidifier, is the subject of newly-issued circular matter received from W. J. Haynes, Kansas City, Mo. Although the manufacturer supplies the humidifier complete to fit in the top of a warm-air furnace, it may be used in connection with any water pan, either in the top or side of the furnace casing. The valve does not depend upon a float for its action. There is a small water-weight tank on one end of a rocker arm and a cast iron weight on the other end. As the water in the pan rises it backs up in the small cone-shaped tank, and this tank, becoming heavier than the weights, shuts down and closes off the water. The port between the valve tank and the water pan is always open. Therefore, when the water evaporates from the pan, it flows out of the water-weight tank, maintaining its level. The tank becoming lighter than the weight, rises and allows the water to flow in from the city main.

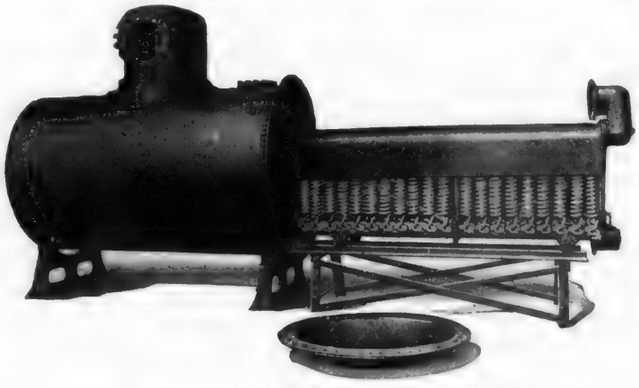
PACIFIC STEEL HEATING BOILERS, manufactured by the General Boilers Co. of Waukegan, Ill., are advocated in a recent catalogue bearing that title. This is Catalogue No. 6 and contains descriptive of the various parts of a boiler and the proper operating and maintenance procedure to be followed in getting the most out of a boiler. Numerous views of the Pacific boiler are shown and extensive tables of dimensions and capacities given. The pamphlet also contains an illustrated sign. Size 6 x 9 in. Pp. 32.

NEWPORT AUTOMATIC FEED BOILER is the subject of an advertising epic recently issued by the Newport Boiler Company, Chicago, Ill., in which is divulged how automatic heat from the Newport boiler saves hours of time and tons of coal. The saving of time is easiest explained as due to the magazine feed feature by which much of the need for attendance is eliminated. The coal saving feature is, however, a longer story, involving questions of feed regulation, grate design, and draft control. We think that the original version of this story may be more interesting than our summary of it, but before leaving the subject we wish to call attention to the special ash spray equipment supplied with this boiler and designed to make ash removal almost pleasant. Folder size 4 x 9 in. Pp. 6.



FEED ADJUSTMENT ON NEWPORT BOILER FOR VARIOUS SIZES OF COAL.

REILLY EVAPORATOR, SELF-SCALING, is treated in Bulletin No. 310 issued by the Griscom-Russell Company, New York. This evaporator is made in several designs among them the submerged, the single header, the double header, the bottle neck, and the steel shell types. Its principle is embodied also in a small drinking water set. All of the above types are described and illustrated in the bulletin. The self-scaling feature is explainable simply, as due to the motion of the coil helices incidental to alternate heating and cooling. This tendency is claimed to be accentuated by the particular form of



REILLY SELF-SCALING EVAPORATOR, COIL SECTION WITHDRAWN.

coils used in the Reilly evaporators. In each of the evaporator types above mentioned, the coils are mounted on a removable frame which can be taken out for inspection, repairs, etc. Size 6 x 9 in. Pp. 24, punched for binding.

VAPOR DETAILS, Bulletin No. 20, issued by the Illinois Engineering Co., Chicago, gives extensive data on the Illinois thermo-modulating system of vapor heating for hotels, apartments, hospitals, schools, and residences. Piping plans and elevations, boiler room assembly, and typical radiator and piping connections (the latter reproduced in the accompanying illustrations) are shown in this pamphlet. There is given also a standard method for computing radiation and boiler sizes. Among the auxiliary parts shown and described in the bulletin are the Illinois packless modulating valve, thermo radiator trap, return trap, vent seal valve, and vapor damper regulator. Size 8 x 10½ in. Pp. 20.

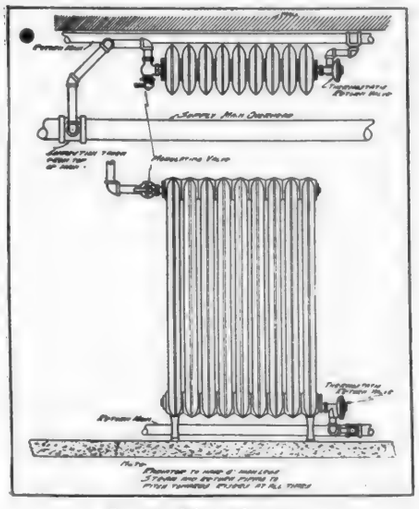
WOOD PIPE of both the machine-banded and the continuous stave varieties, are illustrated and described in a recent pamphlet of the American Wood Pipe Company, Tacoma, Wash. This type of pipe is of interest to heating engineers as steam pipe casing. The standard construction provides three layers of 1/32-in. sheet asbestos paper and AAAA charcoal tin plate as a lining for this make of pipe casing and the inside diameter of the casing is at least two inches greater than the outside diameter of the contained pipe, with interior supporting guides which hold the steam pipe about an inch away from the casing on all sides. **Size 4 x 9 in.** Pp. 12.

STERLING SLIDE VALVE RETURN TRAP is the subject of Bulletin No. 31 of the Sterling Engineering Co., Milwaukee, Wis. In general construction this trap is not radically different from others of its class except that the valve, instead of alternately leaving and contracting with its seat, remains seated continuously, sliding backward and forward to open and close the steam and exhaust ports, an action similar to that of the slide valve on a steam engine. This design is claimed to remove the difficulty arising from fouling of the valve and seat by dirt and grit. A piping diagram for installing the trap is one of the features of this pamphlet. Size 6¼ x 9 in. Pp. 4.

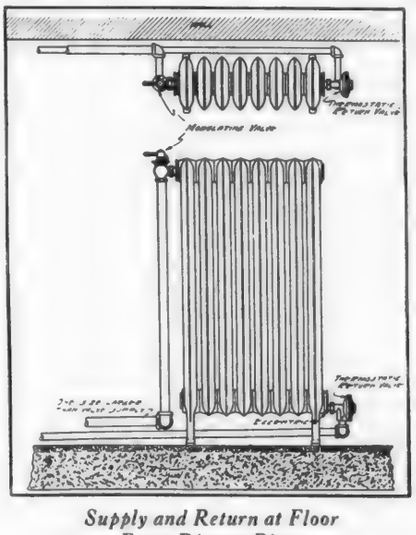
SIMPLEX VAPOR HEATING SYSTEM and the specialties which distinguish it from other vapor heating systems, are described in an attractive pamphlet issued recently by the Simplex Heating Specialty Co., Inc., of Lynchburg, Va. The particular device around which this system is built is the Wiley safety-vent vapor regulator, but the water seal vapor trap and the calibrating radiator valve, are other special features worthy of notice. All of these devices are illustrated in the catalogue which contains also general directions for designing and installing the Simplex modulating system of heating, along with specification data bearing on the same problem. Size 4½ x 7 in. Pp. 28.

ROTO PUMPS are advocated in a pamphlet received from the Roto Pump Mfg. Company, Detroit, Mich. No one reading this folder can fail to be impressed by the superior features of the Roto pump, since these are described both in general and in particular. The description is illustrated by various views of this device, thus enabling the reader to visualize any minor points not thoroughly covered in the text. The object of the Roto pump is to produce flow of water and its accomplishment is by means of a rotary impeller fitting in a cylindrical recess between inlet and exhaust ports in the pump casing. Four grooves in the impeller periphery are fitted with swinging valves which are maintained in contact with the cylinder walls by centrifugal action. These things being true, the rotation of the impeller in the right direction produces a flow of water through the pump. The axis of the impeller is, of course, eccentric. The cylinder walls are formed by arcs of three different radii. A removable liner is provided for the cylinder and can be quickly replaced when worn out. The valves are similarly replaceable. These structural features enable the pump to be maintained in perfect condition without the use of special tools and without the employment of skilled attendance. The casing and bearings of this pump are of sturdy design which, combined with the replacement feature on wearing parts, seems to insure long life and service. Pamphlet size 3½ x 6 in. Pp. 8.

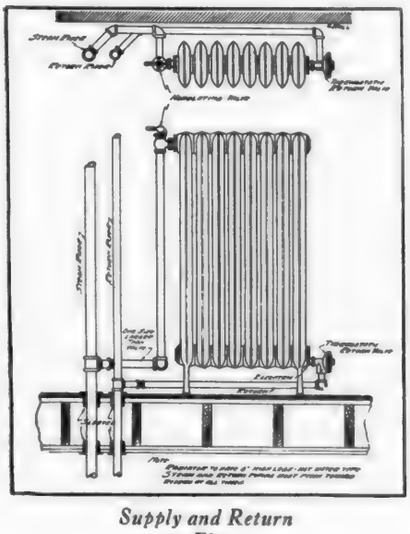
THE WEATHER VEIN issues of April and May seem to be up to the Carrier standard of veinity. Some one has said, regarding exterior conditions, "a great deal has been said about the weather, but very little has been done about it." The Carrier Engineering Corporation will not allow this statement to stand unchallenged in respect to interior weather conditions and in the April issue of their sparkling house organ is discussed means for manufacturing interior weather for rubber making plants. But this is not the only feature of that issue, for it contains also a Southern colonel's Tribute to Water which deserves to stand immortal with the Encyclopaedia Britannica's Ode to Pay. While the May issue is entitled the Drying Number, it is not as thoroughly desiccated as this heading



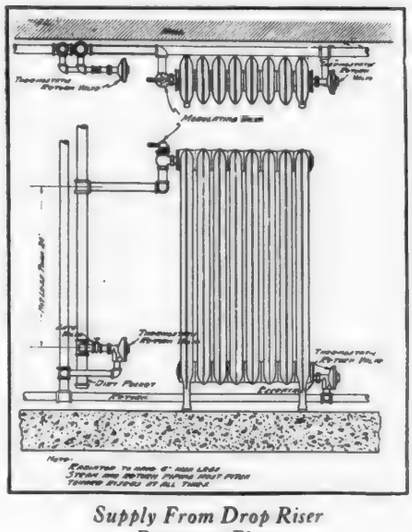
Supply Main Overhead Return at Floor



Supply and Return at Floor From Distant Risers



Supply and Return at Floor



Supply From Drop Riser Return at Floor

TYPICAL RADIATOR AND PIPING CONNECTIONS FOR THE ILLINOIS THERMO-MODULATING SYSTEM OF VAPOR HEATING.

might imply. Size 4 x 7 in. Pp. 32 and 48.

SPENCER CENTRAL CLEANING SYSTEMS, comprising permanently-installed multi-stage turbine vacuum cleaning apparatus for all purposes in buildings of all types, are presented in a new catalogue issued by the Spencer Turbine Cleaner Co., Hartford, Conn. A large portion of the catalogue is taken up with an imposing array of buildings equipped with Spencer apparatus, such as the Woolworth Building, in New York; Massachusetts Institute of Technology, Harvard Freshmen Dormitories, Cincinnati General Hospital, Hotels Pennsylvania and Commodore, New York; and buildings of all types in other cities. Typical sizes of Spencer cleaners are then shown, all being of a multi-stage low-velocity turbine type, designed with special reference to the proportions of vacuum and volume required for vacuum cleaning work. The turbine impellers, or fans, are fastened to the shaft, making one single moving element. There is a clearance of from ⅛ in. to ⅜ in. between the stationary and moving elements throughout the turbine. The separators are of the centrifugal type. In the smaller sizes the dirt receptacles are in the base of the machine, while the 3 H. P. and larger equipments have the dirt separator as a separate unit. Vertical type machines are made in 7½ to 5 H. P. sizes, while the horizontal "slow speed" type is made in 7½ to 25 H. P. sizes, special emphasis being laid on the advantage of operating the larger units at slow speed. This latter type, it is stated, operates at just half the speed which has heretofore been considered necessary for both turbine and centrifugal type machines. Attention is called in the catalogue to the company's testing apparatus at its plant in Hartford, which, it is stated, is always at the disposal of architects and engineers. Size 8½ x 11 in. Pp. 32.

CASH SALES WITH TWO PROFITS is the legend that greets our eye from the cover of a catalog of sales plans for 1921 and installation instructions just issued by the Ilg Electric Ventilating Company, Chicago, Ill. Without looking at the catalog we can say positively that if this offer is expected to discourage the Ilg dealer it will be a flat failure. We think that the prospect of two profits will get a rise out of any dealer. However, two profits are not all that this catalog offers. The next thing observed on closer inspection, is that its text matter is divided, like the whole of Gaul, into three parts. The first part contains, instead of Belgae, descriptions of how to ventilate residence kitchens, stores and offices; lodges, assembly halls, and theatres; restaurants, lunch rooms, etc.; factories; and farm buildings. In each of these special cases there is given, along with the text matter, descriptive diagrams and a sample of the folders furnished to Ilg dealers for free distribution. Printed in three colors, these folders are quite attractive.

In the next part we find, not Aquitani but what the dealer may enjoy just as much, a description of the forms of dealer aid which this concern offers, including display stand, window and show room display sets, letter heads, and cuts for newspaper and magazine advertising. All of these arrangements serve to furnish the dealer an opportunity to more closely associate his name with the name of Ilg. Finally, the third part is devoted to special notes descriptive of the Ilg self-cooled motor feature, Ilg blowers, around the corner cash sales (in which the immediate vicinity of the Ilg dealer is exploited for his benefit), and last but not least, views of the Ilg plant, interior and exterior. Size 11 x 14 in. Pp. 28.

WESTERN AUTOMATIC ELECTRIC CONDENSATION PUMPS AND RECEIVERS are described in Bulletin 220 of the Western Engineering Co., Davenport, Iowa. The special feature of this company's condensation pumping unit is the fact that the pump has but one moving part, the rotary impeller. The unit as a whole includes the pump which is direct-connected to an electric motor mounted on the same base, and a vertical cast-iron receiving tank, also mounted on the common base. The tank casting carries an automatic float switch, provided with an extra heavy copper float. A dimension diagram and table of capacities and sizes are also shown in the folder. Size 8 x 11 in. Pp. 4.

The Marsh Reflux Return-Line Trap.

The appearance of an announcement by the Jas. P. Marsh & Co., of Chicago, Ill., in our advertising pages, in which the Marsh Reflux junior thermostatic traps were referred as the Marsh Reflex traps has led to inquiries as to whether the name of this trap has been changed. We hasten to explain that the Marsh Reflux trap is still the correct designation of this device, the mis-spelling being due to a typographical error.

Deaths.

FRED HENRY SCHARDEIN, youngest member of the heating and plumbing firm of Schardein Bros., Louisville, Ky., died April 26 of appendicitis. He was 35 years old. It will be recalled that his father, Fred S. Schardein, who founded the business in 1872, died a little over a year ago. Mr. Schardein is survived by a widow, and three children, also three brothers and three sisters.

LESTER GRAY FRENCH, for thirteen years editor of *Mechanical Engineering*, the journal of the American Society of Mechanical Engineers, died April 18, following an operation for septic poisoning. Mr. French was also for a number of years assistant secretary of the society. He was 51 years old. From 1897 to 1906 he was editor-in-chief of *Machinery*.

WALTER E. TOLLES, president of the Moline Heating & Construction Co., Moline, Ill., died at his home in Moline, April 15, after a long illness extending over three years. He was 61 years old. Mr. Tolles entered on his business career in Moline in 1881. He became associated with S. S. Davis and T. B. Davis in Davis & Co., out of which grew the Moline Heating & Construction Company, which was incorporated in 1900, with Mr. Tolles as president. Mr. Tolles was a leader in the local building field and was the builder of one of the largest apartment houses in Moline. He leaves a widow and two children.

Death of Albert P. Broomell.

Albert P. Broomell, president of the Vapor Heating Co., York, Pa., notice of whose death was published in last month's issue, was a man of remarkable attainments; his contribution to the industry of the vapor heating idea being but one of his "hobbies." For that reason, perhaps, he was not so well known in the heating trade as some of his contemporaries.

ALBERT P. BROOMELL.

Mr. Broomell got his early mechanical experience in the machine shop of the A. B. Farquhar Company in York, where he was foreman. He next became a member of the firm of Broomell & Frey, brass founders, which later became the Broomell, Schmidt & Steacy Co. He withdrew from that firm about 10 years ago.

When the automobiles first came on the market Mr. Broomell designed a car with six wheels, the front four serving as a steering truck, similar to the front truck of a locomotive. His invention led to the formation of the Pullman Automobile Company which operated a plant in York and was one of the pioneer manufacturers of automobiles.

He was also the inventor of the "Heatencook" range which was designed to heat the house from the kitchen range by hot water circulation through radiators. This was marketed years before his vapor heating system.

It was not until 1900 that he organized the Vapor Heating Company to handle his scheme for heating buildings with steam at practically atmospheric pressure. Two installations were made that year, one in the Hotel Warwick, Newport News, Va., and one in the York Hospital, York, Pa., which are still in successful operation.

Mr. Broomell had a kindly way about him, coupled with a sound philosophy of life, that will long be remembered by many who were helped along the way by his counsel and advice.

IDEAL

IN the IDEAL TYPE "A" HEAT MACHINE is offered an entirely new craftsmanship, which for the first time makes possible the full utilization of the cellar or basement for living and recreational purposes.

This skill in construction guarantees likewise the utmost refinement in heating expression and automatic control, with a recorded average fuel saving of one-third.

The open winter has emphasized the great practical advantage of the Ideal insulated jacket, which retains the heat and contributes to the remarkable efficiency of this heating boiler.

Investigate the claims of the IDEAL TYPE "A" HEAT MACHINE. The record of thousands of installations is convincing proof of its superiority and incomparable economy. It is good judgment to specify and use the IDEAL TYPE "A" HEAT MACHINE in your building plans.

AMERICAN RADIATOR COMPANY

Sales Branches in all Large Cities

Makers of the world-famous IDEAL BOILERS and AMERICAN RADIATORS

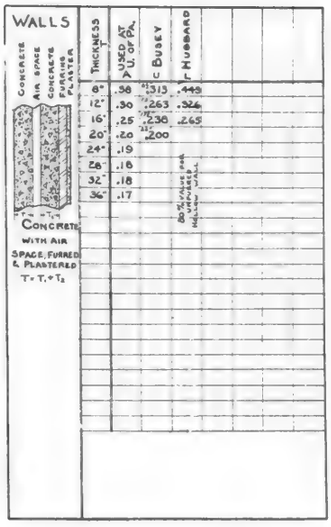
"Just as every Attic has a past, so every Cellar has a future"

New IDEAL Type A Heat Machine

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

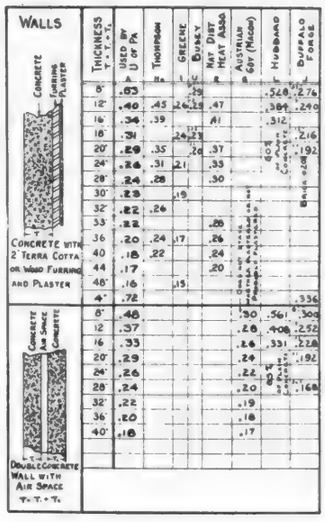
HEAT LOSS TABLES

WALLS



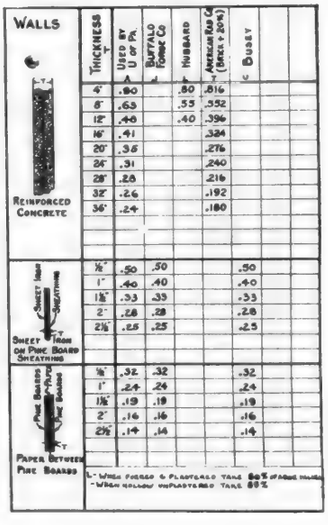
Thickness T	Used at U of Pa. A	C Dudley	F Hubbard
8"	.38	.313	.449
12"	.30	.263	.324
16"	.25	.238	.265
20"	.20	.200	
24"	.19		
28"	.18		
32"	.18		
36"	.17		

WALLS



Thickness T + T + T	Used by U of Pa A	Thompson	Greene L	Dudley	New Dist. Heat Assoc.	Austrian Gov't (Method)	Hubbard F	Buffalo Forge
8"	.63			.29			.528	.276
12"	.40	.45	.26	.19	.47		.384	.240
16"	.34	.39			.41		.312	
18"	.31		.24	.23				.216
20"	.29	.35		.26	.37			.192
24"	.26	.31	.21		.33			
28"	.24	.28			.30			
30"	.23		.19					
32"	.22	.26						
33"	.22				.28			
36"	.20	.24	.17		.26			
40"	.18	.22			.24			
44"	.17				.20			
48"	.16		.15					
4"	.72							.336
8"	.48					.50	.561	.300
12"	.37					.28	.408	.252
16"	.33					.26	.331	.228
20"	.29					.24		.192
24"	.26					.22		
28"	.24					.20		.168
32"	.22					.19		
36"	.20					.18		
40"	.18					.17		

WALLS



Thickness T	Used by U of Pa. A	Buffalo Forge Co L	Hubbard F	American Rad. Co (Brick + 20%) T	C Dudley
4"	.80		.80	.816	
8"	.63		.53	.552	
12"	.48		.40	.396	
16"	.41			.324	
20"	.36			.276	
24"	.31			.240	
28"	.28			.216	
32"	.26			.192	
36"	.24			.180	
⅛"	.50	.50			.50
1"	.40	.40			.40
1⅛"	.33	.33			.33
2"	.28	.28			.28
2⅛"	.26	.25			.25
⅛"	.32	.32			.32
1"	.24	.24			.24
1⅛"	.19	.19			.19
2"	.16	.16			.16
2⅛"	.14	.14			.14

L - When Furred & Plastered take 80% of above Values
- When Hollow Unplastered take 60%

B. T. U. LOSSES—Jones Tables (Continued). No. 1-P

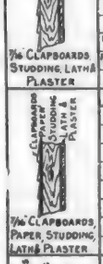
THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

HEAT LOSS TABLES

WOODEN WALLS

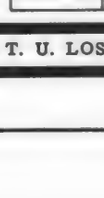
Thickness T	A Used by U. of Pa.	B German Gov (Wolff)	F. Peclet Carpenter	Austrian Gov (Macon)	— Greene 1915	C Buffalo Forge Co.	K Snow			H Nat Dist. Heating Assn	I American Rad. Co	C Busey	Recknagel & Rietschel Pine Inner C	Recknagel & Rietschel Pine Outer C	Recknagel & Rietschel Oak Inner C	Recknagel & Rietschel Oak Outer C	D Harding	N Irwin
1/8	.86			.56						.56								2.9
1/2	.78			.52		.77				.52		.77	.52	.56	.64	.70		
3/4	.69			.44	.27	.55				.44			.44	.47	.59	.63		
1	.59	.41		.41	.24	.48	.51			.41		.51	.39	.41	.54	.58	1" .347	
1 1/2	.51				.21	.40	.43	.30				.43	.31	.32	.47	.50	1 1/2" .370	
2	.43					.34	.35	.257		.28		.35	.26	.27	.41	.43		
2 1/2	.39						.30	.228				.30	.22	.23	.37	.39	2" .279	
3	.36							.20					.19	.20	.33	.35		
3 1/2	.32																	
4	.29		.120															.24
8	.17		.065															.46
12	.13		.045															
16	.10		.033															
18	.09		.031															
20	.08		.030															
24	.07		.029															
28	.06		.027															
32	.05		.025															
36	.05		.020															
40	.04		.018															
1 1/2"	.55										.22		2" .34	2" .36	2" .50	2" .54		

FRAME WALLS



7/8" CLAPBOARDS, STUDDING, LATH & PLASTER

7/8" CLAPBOARDS, PAPER, STUDDING, LATH & PLASTER



7/8" CLAPBOARDS, PAPER SHEATHING, BRICK & PLASTER

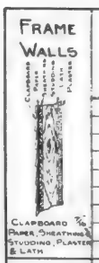
Thickness	A Used by U. of Pa.	O Kneealy	E Thompson	Buffalo Forge Co.	F Hubbard	Z Allen	O Hoffman	D Harding	D Tweed	H Nat Dist Heating Assn	— Greene 1915	H & V Magazine 1917	K Donnelly	N Irwin			
	.45	.44	.44	.44	.30	.1	.25 to .30	.47	.25	.45		.44	.471	.29			
Without L.C.D.	.48											.47		Frame Wall Construction			
Factory Blgs.														.24 to .46			
	AA	DD	HH	JJ	LL	NN	OO	PP	QQ	RR	II	WW	XX				
	.31	.31	.31	.31	.30	.1	.25 to .30	.34		.31		.31	.343				
Without L.C.D.	.34				For Walls in Average Wind Pressure	For Ordinary Wind Pressure Construction	For Walls in Exposed Situations					.34						
	AAA				LLL	NNN	OOO	PPP	QQQ		III	WWW					
	.30				.30	.1	.25 to .30	.21	.25		.20						
												.22 Clapboards, Brick Lined & Plastered					

B. T. U. LOSSES—Jones Tables (Continued). No. 1-Q

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

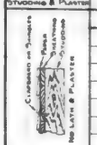
HEAT LOSS TABLES

FRAME WALLS



Thickness	Used by U. of Pa.	O Kineally	Thompson	Greene 1913	J. Buffalo Forge Co.	K Snow	F Hubbard	Z Allen	O Hoffman	Harding	R Nat. Dist. Heating Assn.	American Rad. Co.	H&V Magazine 1917	X Donnelly
	.24	.23	.23	.20	.23	.228	.30	.1	.25-.30	.20	.24		.23	.257
							Non-wall or tree bearing	For ordinary wood construction	For walls of tree bearing	Girder with no support				

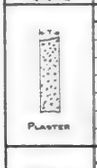
	AA	DD	HH	II	JJ	KK	LL	NN	OO	PP	RR	TT	WW	XX
	.29	.28	.28		.28	.286	.30	.1	.25-.30	.30	.29	.280	.27	.30
without L.L.P.													30	



	AAA			III							RRR		WWW	
	.29			.31							.27		.26	

WALLS

Thickness	Used by U. of Pa.	Prussian Gov't Rechnagel	O Kineally	Greene	F Hubbard	O Hoffman	Q Tweed	R Nat. Dist. Heating Assn.	H&V Magazine 1917	Haussger Practice	O Austrian Gov't (Mecom)	X Donnelly
	.10			.08			.10					



	AA	VV	LL	OO	QQ	RR	WW	YY	GG
½"	.61	.815						.60	.62
¾"	.52	.492						.48	.59
2"	.60		.60	.60	.60	.60	Wire lath cement & plaster		.56
3"	.50		.50	.50	.50	.50			.53
									.50
1½-2½	.61						.61		.47
3"-3½	.50						.49		

	AAA						RRR				XXX
	.21						.21				.214

B. T. U. LOSSES—Jones Tables (Continued). No. 1-R

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

HEAT LOSS TABLES

WALLS

Ordinary Stud Partition Plaster both sides

Thickness T	> Used at U. of Pa.	O Kinealy	Z Thompson	- Greene 1913	⊂ Buffalo Forge Co.	X Snow	O Hoffman	@ Tweed	≥ Nat. Dist. Heat. Assn.	⊄ H.C.V. Magazine 1897	× Donnelly
	.34	.34	.34	.36	.34	.143	.34	.34	.34	.34	.30

Ordinary Stud Partition Plaster on one side

	AA	DD	HH	II	JJ	KK	OO	QQ	RR	VV	XX
	.62	.60	.60	.49	.60	.257	.6	.49	.54	.60	.60

Double Board with Sawdust between

Saw Dust	AAA	JJJ
2"	.13	.127
4"	.09	.083
6"	.06	.062
8"	.05	.049

WALLS

Thickness	Used at U. of Pa.	Z Thompson	⊂ Buffalo Forge Co.	↑ Husband	⊄ American Radiator Co.	H.C.V. Magazine 1897	⊂ Dubey
	.17						
½"	.45		.45				.45
1"	.36		.36				.36
1½"	.30		.30				.30
2"	.26		.26				.26
2½"	.23		.23				.23

Corrugated Iron or Metal Lined with T & G Boards

	AA	MM	JJ	LL	TT	WW
	1.50	.84	.50	LEO	.840	.84

Unlined Corrugated Iron or Metal

	AAA	JJJ
	1.20	1.20

Sheet Iron Siding Unlined

WALLS

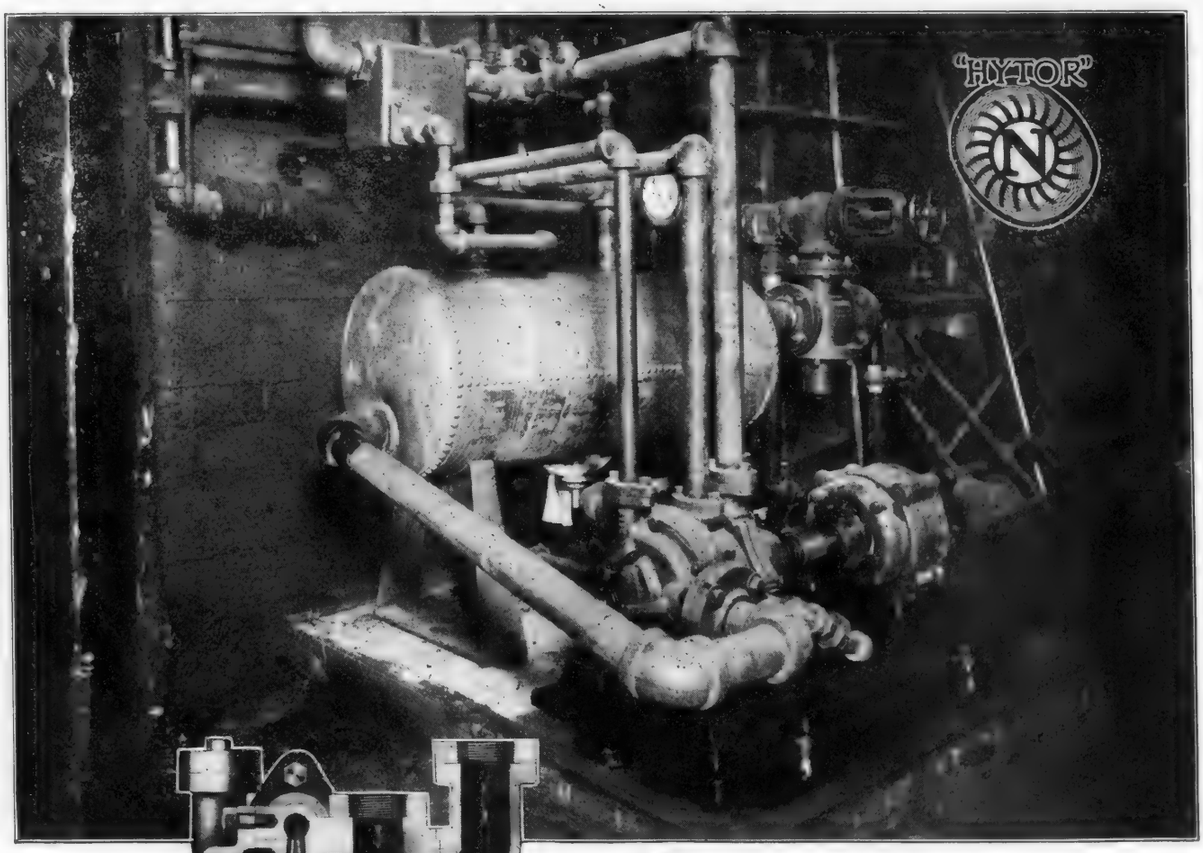
Thickness	> Used at U. of Pa.	- Greene 1913	G Tweed	≥ Nat. Dist. Heat Assn.
	.34	.34		.34

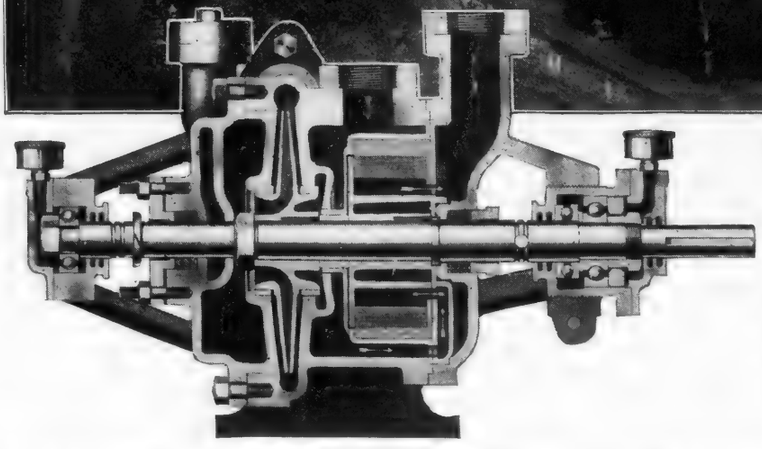
	AA	II	QQ	RR
	.21	.21	.21	.21

	AAA

B. T. U. LOSSES—Jones Tables. No. 1-S

EFFICIENT HEATING *demands the* JENNINGS PUMP





Size B Unit, Continuous Operation

WALDORF HOTEL
SEATTLE, WASH.

Capacity 16,000 sq. ft. direct radiation; air capacity 11 cubic feet per minute in addition to a water capacity of 22 gallons per minute.

The motor is only 1½ H.P.

THE Jennings Pump consists of two independent turbine units, an air pump and a water pump. As each material is handled separately, the boiler pressure is against the water only. The air and vapor, approximately four-fifths of the volume handled, are delivered to atmosphere without back pressure. The saving in horse power is over fifty per cent. In other words, the cost of current to operate is cut in half.

Because of its compact design, this equipment can be installed in less than one-third the space necessary with other apparatus. All interior parts are bronze, supported on annular ball bearings mounted outside of casing. Moving parts revolve without contact.

Quiet, reliable operation, without annoyance because of shut downs, and minimum of expense for repairs, is assured if the Jennings Hytor Vacuum Heating Pump is installed on your Vacuum Heating System.

There are many other reasons why the Jennings is being installed on practically all of the big jobs. Bulletin No. 8 gives them in detail. Write for it.

NASH ENGINEERING COMPANY

SOUTH NORWALK, CONN., U. S. A.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

TRADE AND MISCELLANEOUS NOTES

Coming Events.

June 14-17, 1921.—Semi-annual meeting of the American Society of Heating and Ventilating Engineers, in Cleveland, O. Headquarters at the Hotel Winton.

June 22-24, 1921.—Twelfth annual convention of the National District Heating Association, at Cedar Point, O. Headquarters at "The Breakers."

Miscellaneous Notes.

Minneapolis, Minn.—Who says the heating industry cannot get newspaper publicity? The following is taken from the Minneapolis, Minn., *Tribune* for May 3, 1921: "Doctor L. A. Scipio, dean of the United States Bureau of Research, and a group of widely-known engineers conducted tests today on the experimental system of ventilation installed at the Whitney School. The Whitney School ventilating equipment has been regarded by the Bureau of Research as offering the best field in the United States to conduct experiments with this form of equipment," etc.

Waterloo, Ia.—A novel feature of the new west high school building, under construction in Waterloo, is the arrangement of the gymnasium and auditorium whereby the gymnasium is separated from the stage of the auditorium by two disappearing doors which may be made to fold back into recesses on either side. By this arrangement the entire auditorium may be used to seat spectators at a basketball game and each side in the auditorium affords a clear view of the gymnasium. The heating and ventilating facilities for the auditorium can be operated separately from the rest of the building.

St. Cloud, Minn.—Because a combination bid on the installation of heating and plumbing systems for the new Stearns County Court House was made, instead of separate bids for each part of the work, the legal advisers of the county have advised the county commissioners that they cannot legally enter into a contract with the Healy Heating and Plumbing Co., of St. Paul, who had been awarded the contract. The Healy company's combination bid was $55,334, which included the heating and ventilating system, water supply and drainage, vacuum cleaning system, deep well and pumping equipment. This offer was $2,517 lower than the lowest combination of separate bids and $6,458 lower than the only other combination bid offered. It was decided to advertise for new bids on this work, provision being made for every possible combination of bids that might be submitted.

Chicago, Ill.—Charging conspiracy which, it is claimed, doubled the prices of certain building materials in Chicago, the Federal grand jury has returned indictments against 110 individuals and firms in the steam fitting, plumbing and sheet metal lines in that city. In three blanket bills by groups, they are charged with conspiring to restrain trade in violation of the Sherman act. Boycotts of outside material by "illegal combinations" under attack are held by the government authorities to have increased the prices of heating apparatus 100% during the last three years, the price of plumbing supplies 150% and the price of sheet metal 100%.

The Best Known Plants in America Use Batterman-Truitt Ventilating Equipment

Autovent Exhaust Fan for Exhausting Fumes, Heat and Gases from Enameling Vats and Ovens

Autovent Propeller Fans

are especially adapted for installations in industrial and manufacturing plants for overcoming objectionable features created by various manufacturing processes.

It has been conclusively demonstrated that employees can accomplish more work and do it much more efficiently in well ventilated rooms.

The progressive factories of today consider the installation of a fan or ventilating system an investment and not an expense.

Are you devoting any of your time to this class of business? Let us co-operate with you in increasing your present volume of business.

Write Dept. F for complete details

Manufactured by **BATTERMAN-TRUITT COMPANY**

General Offices and Works

730-38 W. Monroe St., Chicago, Ill.

Branch Offices in all Principal Cities

An indictment against the steam fitters, in one count, runs against the Master Steam Fitters' Association and eighteen corporations, 23 individuals, who are members of the corporations and one official of the Steamfitters' Protective Association of Chicago, a labor union. It charges restraint of trade through conspiracy between the master steam fitters of Chicago combined among themselves and with the union's business agent to refuse to trade with any manufacturer selling his products to any other than members of the steamfitters' association. It is set forth that the union representatives abetted this by refusing to furnish workers to any contractors or master steam fitters who are not members of the steamfitters' association.

In the case of the plumbing and sheet metal indictments, it is alleged in each case that these industries were able to prevent all sheet metal and plumbing products made outside of Chicago from coming into the local market.

The indictments were independent of the Daily commission's inquiry into abuses in the building industry.

New York.—An echo of the Hettrick "Code of Practice" agitation was noted in the letting of the contracts for heating and ventilating Public Schools 20 and 29, Brooklyn, and 11, Richmond, entered into with Gillis & Geoghegan, New York, which were allowed to stand upon the firm's consenting to deduct from the contracts $2,196, the amount paid Hettrick. The same course was adopted with J. D. Rice, who has the contract for heating and ventilating Public School 182, Brooklyn, Mr. Rice agreeing to deduct $1,533.30, the sum which he paid Hettrick. Philip & Paul, who have the contract for heating and ventilating Public School 3, Queens, were allowed to continue upon agreeing to deduct $517. Hettrick's name did not enter into this agreement.

American business men are cutting down their overhead expenses to meet the public demand for lower prices by calling for more work from fewer men, demanding greater efficiency per inch

HIGH EFFICIENCY TRADE ILG MARK VENTILATING MACHINERY

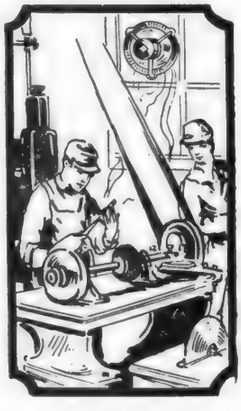
Ventilation
FOR OFFICES · STORES · FACTORIES · PUBLIC BUILDINGS RESTAURANTS · THEATRES · HOUSES · ETC.

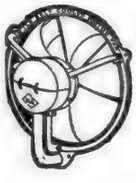
The Public is rapidly learning to shun poorly ventilated rooms and buildings, which breed health foes that lurk in foul, dead air.

"The Air You Breathe Should be as Pure as the Water You Drink"—that is the warning public health officials are spreading broadcast.

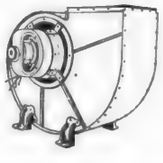
Heating and Ventilating Contractors will find much business awaiting them everywhere. The demand for ILG apparatus proves this. Send for literature.

ILG Self Cooled Motor Fans
ILG Universal Blowers
ILG Air Unit Heaters
ILG Air Humidifiers and Air Washers

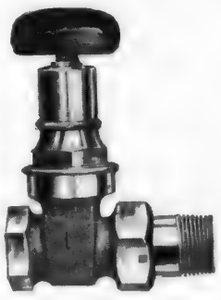




ILG ELECTRIC VENTILATING CO.
2858 N. Crawford Ave.
CHICAGO, ILL.
Branches in all large cities



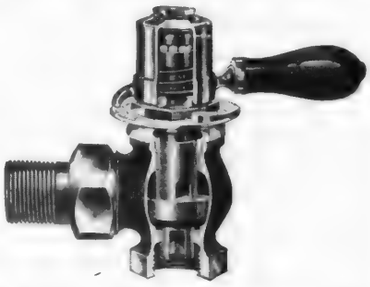
Dole



WE elected years ago to be the builders of the best radiator valves on the market. We have succeeded in our ambition. If any man desires to study the radiator valve field—he will become convinced of the fact that Dole Radiator Valves dominate their market.

A VALVE FOR EVERY SYSTEM

Write for catalogue and discounts



DOLE VALVE CO., Chicago, Ill.
1933 Carroll St.

At Supply Houses Everywhere

JENKINS VALVES are obtainable in every locality where valves are used. Their distribution is nation-wide and world-wide.

The man who knows valves and valve requirements installs "Jenkins." He has seen them in service as reliable and free from trouble after years of use as on the day of their installation. The dependability and longevity of Jenkins Valves are due chiefly to the fact that each valve in every type is made for the maximum service, not merely for the average.

JENKINS BROS.
New York Chicago Philadelphia Boston
Montreal London Havana
FACTORIES: Bridgeport, Conn.; Elizabeth, N. J.; Montreal, Canada

Jenkins Valves
SINCE 1864
2246-J

2 things to find out about a Radiator Trap

1. Does it discharge air and water?

There are a good many traps that discharge water in a dependable manner—but how about the air?

The simplest, most reliable and cheapest way of keeping steam lines free of air and water is by the use of the Johns-Manville Radiator Trap. It discharges the air *with the water*, continuously—on vacuum as well as pressure heating systems.

2. Does it retain steam?

Maybe you say "Yes, if it doesn't stick," or "When the thermostatic member is adjusted properly."

The Johns-Manville Radiator Trap, with no valves or thermostats, just a strong, hollow, floating copper ball, prevents loss of steam. It discharges air and water as they are received, without regard to temperature or any other condition except the mere fact that the air and water are in the trap and should be got rid of without losing steam.

The Johns-Manville Radiator Trap

An unattached, floating ball is the only moving part of the trap. The forces that control its movement are the buoyant force of the liquid and the unbalanced pressure on the area of the discharge orifice.

When the entering water raises the ball, the discharge orifice is exposed and the water and air are free to flow out of the trap.

When the water level drops, the ball drops, gradually rolling over the discharge orifice, thus throttling down the outflow and maintaining sufficient water in the trap to provide a water seal and prevent the leakage of steam.

JOHNS-MANVILLE
Incorporated
Madison Ave., at 41st St., New York City
Branches in 63 Large Cities
For Canada: CANADIAN JOHNS-MANVILLE CO., Ltd., Toronto

JOHNS-MANVILLE
Radiator Trap

of advertising, depending more on budget and cost-accounting systems, and by scrutinizing credits more closely, according to a survey just completed by the Department of Domestic Distribution of the Chamber of Commerce of the United States. Saving in publicity found a wide division of opinion. More than a fourth of those answering said they had cut down advertising space. This was in part balanced by reports from many others who found depression a justification for an increased use of space.

Washington, D. C.—Nearly half of the country's $8,000,000,000 export trade in 1920 consisted of only ten commodities, and seven of these ten, constituting a third of the entire exports, exclusive of exports of foreign merchandise, are either foodstuffs or raw materials, according to a bulletin issued by the United States Chamber of Commerce. The ten leading exports are, in order: raw cotton, wheat, coal, automobiles, leaf tobacco, cotton cloth, wheat flour, lubricating oil, bacon and lard.

American Society of Mechanical Engineers, through its Fuel Division, has undertaken the formation of Fuels Committees under the auspices of each of the local sections of the society. In a questionnaire sent to each of the chairmen of the local sections, each chairman was asked to name the leading authorities on fuels in his section, to give a list of the forthcoming meetings on fuel subjects, and to recommend five members in the section who would constitute a local committee on fuels and assist in the program of the Fuels Division. Among the activities suggested for the local committees are fuel meetings in which local organizations could be asked to participate, the furnishing of speakers for the meetings of local organizations of engineers, and the furnishing of help to civic authorities in stimulating fuel economy and informing the local press of facts about the elimination of unnecessary waste. Besides this, the committees can be of service to the Fuels Division by tabulating fuel facts and performances in its vicinity.

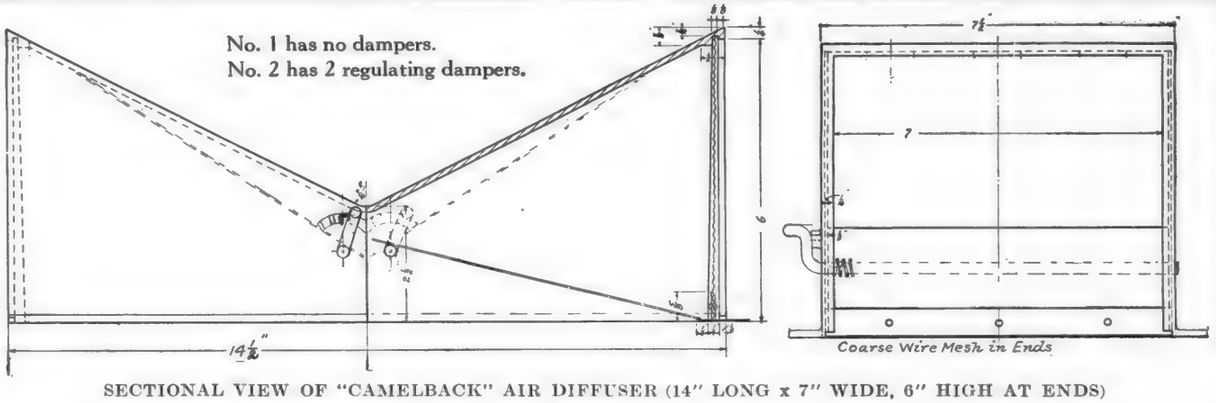
Washington, D. C.—Permanent headquarters of the Federated American Engineering Societies have been established in Washington at 719 Fifteenth St., N.W., with L. W. Wallace, secretary of the Federation in charge. It is stated that the present membership of the Federation includes 24 engineering societies and clubs, representing a total membership of nearly 50,000 engineers. The resignation as president of Herbert Hoover was announced at a recent meeting of the executive committee in Philadelphia, Mr. Hoover stating that as a member of the executive branch of the government he could not consistently direct the activities of an organization which is engaged in furthering national activities involving legislation. It was felt, however, that his leadership during the organization period of the council and his initiation of policies have served to place the organization in an advantageous position which will enable it to make rapid strides toward the accomplishment of its objects.

Geo. H. Gibson Co., New York, consulting engineers "specializing in commercial research and advertising of technical products," has moved its offices to the Hide and Leather Building, 100 Gold Street.

Engineering Business Exchange, New York, announces that John J. Swan has become associated with the exchange. For the past two years he has been with the Prest-O-Lite Co., of Indianapolis.

French and American Universities have arranged to exchange professors of engineering and applied science. The American professor chosen is Dr. A. E. Kennelly, professor of electrical engineering at Harvard University and the Massachusetts Institute of Technology. The French universities will be represented by Professor J. Cavalier, rector of the University of Toulouse, and a well-known authority on metallurgical chemistry, who will come to America this fall, and will divide his time during the ensuing academic year among the seven co-operating institutions, namely, Columbia, Cornell, Harvard, Johns Hopkins, Massachusetts Institute of Technology, Pennsylvania and Yale.

"Own Your Home" Exposition, held at the Twenty-second Regiment Armory, New York, during May, was well



SECTIONAL VIEW OF "CAMELBACK" AIR DIFFUSER (14" LONG x 7" WIDE, 6" HIGH AT ENDS)

Distribution of Fresh Air in Theatre, School and Church Auditoriums by the Use of "Camelback" Air Diffuser

Will appeal to every Architect, Heating and Ventilating Engineer and Contractor.

Less duct work required, saving a great expense in masonry.

Maximum quantity of air delivered (84 sq. in.) with minimum number of diffusers.

Friction loss negligible.

Admits of the use of the *lowest slung* chair seat.

Made of cast iron—no parts removable. It is fool proof. A new and proven device.

Blue Prints and Prices on Request

Knowles Mushroom Ventilator Co., 9 Church Street, New York

SPECIFY BUFFALO

One of the Important Factors of Every Building about to be constructed is the Heating System. Obviously to give the client the most for his money is the first consideration.

It is comparatively simple to install a heating system, but it is another matter to make it always efficient.

Buffalo Fan Systems are no higher in first cost, and their upkeep is off-set by the saving in heat, the increase in efficiency of the workers.

Putting heat mechanically just where it is wanted by keeping it in circulation instead of letting it escape thru the ventilation in the roof, is the cheapest and best way.

Our Catalogs give valuable engineering data on heating and ventilating problems. Our engineering department is always available for consultation.

Write Dept. 37

Offices in All Principal Cities

BUFFALO FORGE COMPANY

BUFFALO, N. Y.

attended. The official souvenir program contained a page article on "House Heating with Comfort and Economy" by D. Rait Richardson, chairman of the Heating and Sanitation Committee. Among the exhibitors were the Pierce, Butler & Pierce Corporation, Vesuvius Engineering Co., showing gas heating units for steam and water, and the Richardson & Boynton Co. One of the features of the exposition was a demonstration to visitors by William D. Carter, president of the Metropolitan League of Savings and Loan Associations, of a financial plan for building homes, where one-third of the cost has been saved. A number of model homes were on exhibition.

Building Operations in April, according to figures published by the F. W. Dodge Company, were greater than for any other month since June of last year. Contracts awarded in the 25 northeastern States during April amounted to $220,886,000. This is the largest figure recorded for April of any previous year except 1920. April, 1920, was the peak of last year's boom. Residential building maintained the lead over all other classes. This class amounted to $75,015,000, or 34% of the total. Public works and utilities took second place, with $48,043,000, or 22% of the total. Business buildings accounted for 13%, or $29,176,000; and educational buildings 10%, or $22,640,000.

Contracts awarded in New England States in April amounted to $17,828,000, an increase of 35% over the March figure. In New York State and northern New Jersey the figures were $51,027,000, an increase of 70% over March. Of this total 55% was for residential buildings. The middle Atlantic States showed a slight increase over March, with a total of $27,246,000. In the Pittsburgh district the increase was 8%, the figures being $42,020,000. April building contracts in the central west were 55% over the March figures and amounted to $75,096,000. In the northwest a slight increase was reported, the total being $7,670,000. In all districts the contemplated work reported reaches impressive figures.

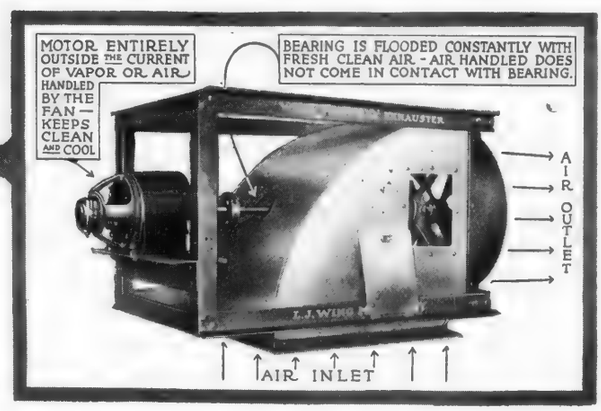
New York.—The existence of a group of interlocking associations covering all parts of the country, except the Pacific Coast, and consisting of 1,000 manufacturers and jobbers of plumbing material and fittings, with a capitalization of $300,000,000, and exchanging information on prices, was revealed before the Lockwood Committee during an examination of Frank S. Hanley, secretary of the associations. It was stated that the chief of the organizations was the National Committee of the Confederated Supply Associations.

New York.—Speaking of the building outlook in New York and vicinity, Henry H. Curran, president of the Borough of Manhattan, states that "for the first time in four years there are signs of a general building of apartment houses in New York City. The records show that during the past eight weeks (up to May 14) the plans filed call for the accommodation of 2,733 families, in apartments, an increase of 454% over the corresponding period of 1920. The average cost of the new apartments is $4,689, which brings them within the $5,000 limit of the tax-exemption ordinance."

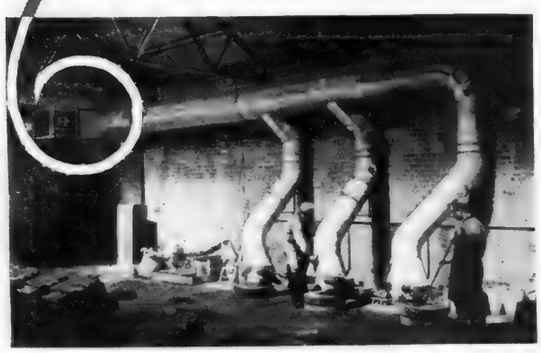
Manufacturers' Notes.

Skinner Bros. Mfg. Co., Inc., St. Louis, Mo., manufacturer of the Baetz patent air heater, ventilating, air-drying and blow-pipe apparatus, has recently acquired a factory in Elizabeth, N J., covering 3½ acres. The factory is served by switches of the Central Railroad of New Jersey and the Pennsylvania lines. The new plant was secured for the manufacture of all Skinner Bros. products for shipment east of Pittsburgh. The general offices of the Skinner Bros. Mfg. Company will continue to be located in St. Louis. The officers of the company are: President, Fred A. C. Skinner; vice-president and secretary, Merrill G. Skinner.

REMOVE THE POISON


MOTOR ENTIRELY OUTSIDE THE CURRENT OF VAPOR OR AIR HANDLED BY THE FAN — KEEPS CLEAN AND COOL
BEARING IS FLOODED CONSTANTLY WITH FRESH CLEAN AIR - AIR HANDLED DOES NOT COME IN CONTACT WITH BEARING.
EXHAUSTER
AIR OUTLET
AIR INLET

Catch it before it has a chance to spread throughout your entire plant. It is easier to remove poisonous gases, acid fumes, smoke, steam, paint spray vapors, etc., from their point of origin with a Wing-Scruplex Exhauster, than to try to remove them after they have spread about.



Note the WING-SCRUPLEX EXHAUSTER REG. U.S. PAT. OFF.

in the accompanying illustration is removing poisonous fumes from the melting furnaces and discharging them directly to the outside. Before the Wing-Scruplex Exhauster was installed, the workers had frequent attacks of "Spelter Shakes"—a result of breathing poisonous gases from the furnaces and each attack cost several days' time. Now such a thing is unknown.

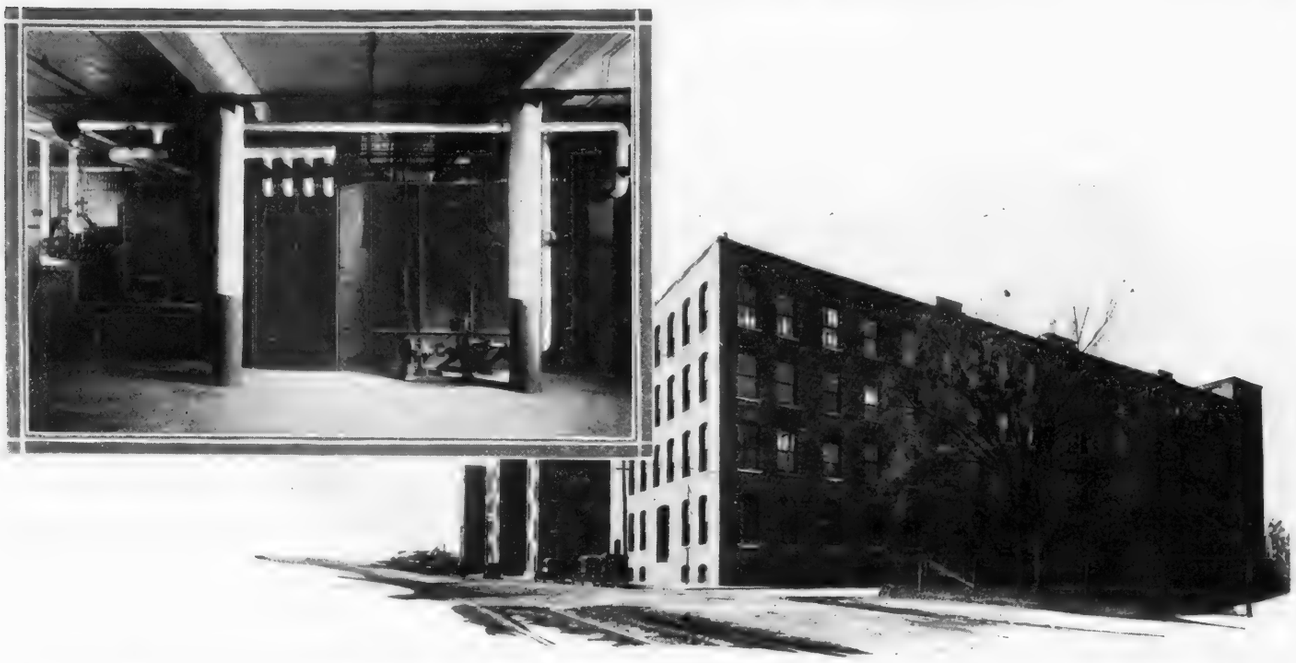
Hundreds of Wing-Scruplex Exhauster installations have been made in practically all industries, for diverse purposes.

May we tell you how to solve your problem?

L. J. Wing Mfg. Co.

Fans and Blowers (All Types) Dampe- Regulators Small Turbines

9th Ave., and Hudson Street, New York, N. Y.



"Sirocco" Air-Conditioning Apparatus installed in the factories of the Export Leaf Tobacco Co., Richmond, Va.

McNickle & McMahon Co., Richmond, Va., Heating and Ventilating Engineers

Dry air and dust are the enemies of tobacco workers. Dry air means dry tobacco with the resultant waste caused by breakage of brittle leaves. Dust means unhealthy workers because lungs become poisoned when breathing tobacco dust hours at a time, day in and day out.

"Sirocco"
TRADE MARK

Air Conditioning Apparatus has changed this in many tobacco plants. Take the Export Leaf Tobacco Co., Richmond, Va., as an example. In this factory Sirocco Air Conditioning Equipment washes, purifies, cools and humidifies the air. It makes the tobacco just right for handling.

While the above applies to the tobacco factory, Sirocco equipment is in use in thousands of industries of various sizes and kinds for heating, ventilating and air conditioning.

Our sales engineers are at your service on any work where Sirocco is being considered.

AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Fulton Co., Knoxville, Tenn., manufacturers of Sylphon temperature regulators, packless valves and steam specialties, has moved its New York branch to the Hudson Terminal Building, 30 Church Street, New York. The company has also secured new and larger quarters for its Chicago branch in the recently completed Wrigley Building, on Michigan Avenue.

Gold Car Heating & Lighting Co., Brooklyn, N. Y., has moved its offices and warehouse to the Bush terminal, 220 Thirty-sixth Street, Brooklyn.

Ross Heater & Mfg. Co., Buffalo, N. Y., announces the opening of a branch office in New York, at 2 Rector Street, discontinuing its sales agency. The New York office is in charge of C. M. Hardin, who was formerly located at the company's home office.

Richardson & Boynton Co., New York, has moved its Boston branch office to 60 High Street, a few doors from its former quarters.

Trane Co., La Cross, Wis., announces the removal of its Chicago office to the Webster Building, 327 So. La Salle St.

Burnham Boiler Corporation, Irvington, N. Y., has moved its western office, located in Chicago, to 15 East Van Buren Street. The company has also opened a warehouse in Chicago. J. M. Chapman, Jr., is western manager.

York Heating & Ventilating Co., York, Pa., has acquired the plant of the Badenhausen Co., in Bridgeport, Pa., manufacturers of power boilers. The York company plans to occupy the Badenhausen plant and to extend its manufacturing facilities.

Koalsave Vacuum Valve Co., Inc., New York, has moved to the Architects' Building, 101 Park Avenue.

United States Radiator Corporation, Detroit, Mich., held a conference of its western branch managers in Chicago, May 6, to discuss the building situation and the outlook for the coming year.

Atmospheric Conditioning Corporation, Philadelphia, Pa., has moved its Chicago office from the 13th to the 8th floor of the Monadnock Block, 53 West Jackson Boulevard.

Steel & Radiation, Ltd., Toronto, Canada, has passed into the hands of a receiver. The company manufactures boilers, radiators and other heating apparatus, with plants in Toronto and St. Catherines, Ont. During the war the plants were given over largely to the manufacture of munitions and it is stated that adjustment to normal lines has been difficult. The company was capitalized at over $2,000,000, and there are $1,000,000 of bonds outstanding.

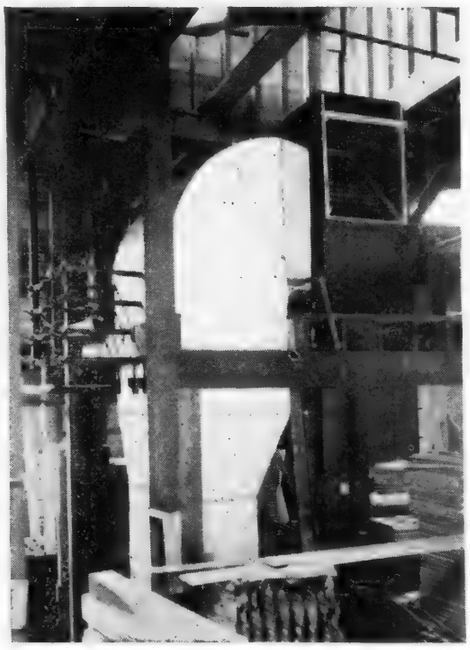
Spencer Regulator Co., Salem, Mass., is building a $40,000 addition to its plant, consisting of a one-story brick structure, 49 x 80 ft.

Uehling Instrument Co., New York, manufacturer of fuel-saving equipment, has moved its Chicago office to the Great Northern Building, 20 West Jackson Boulevard. Walter C. Lange, formerly of the New York office, has been appointed manager.

Kewanee Boiler Co., Kewanee, Ill., announces the resignation of Harry E. Pursell as general sales manager for the company, due to ill health. Mr. Pursell has held this position for the past 20 years and has been closely identified with the development and progress of the company. It is felt that by relinquishing his business duties he may be able to regain his health, a hope that will be echoed by his host of friends. His place has been taken by Robert B. Dickson, formerly district manager for the company in Chicago. A. B. Martin, formerly assistant general sales manager, will take charge of the Chicago district sales branch.

American Radiator Co., Chicago, Ill., will move its general sales, industrial sales and specialty departments from Chicago to Buffalo on July 1. The Buffalo offices will be located at 1807 Elmwood Avenue.

Buffalo Forge Company is carrying on a complete remodeling of its plant simultaneously with regular manufacturing operations and without interfering with the latter in any way. This concern states that it started about forty years ago in a two story shop of modest proportions and that it has grown to occupy at present the greater portion of four city blocks. In 1917 work was started on the converting of the old type one story manufacturing portion into modern brick and steel saw-tooth construction. This work was



HACKNEY "V" BLADE BLOWER
Installed with indirect heating plant

BLOWERS!?

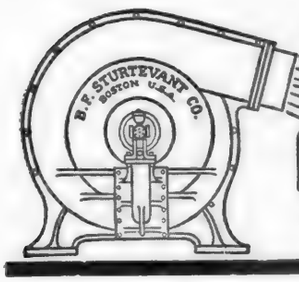
HACKNEY "V" BLADE BLOWERS

Solid "V" Blade Construction
Long Life
Maximum Service
Minimum Cost

Write for our catalog and data book

Sales agents wanted in all territories

HACKNEY MANUFACTURING CO.
ST. PAUL, MINN.
Manufacturers of Blowers and Ventilating Equipment



Sturtevant

REG. U.S. PAT. OFF.

PUTS AIR TO WORK

Below are listed our twenty-four branch offices. In each there is a competent engineer ready to discuss your problems. Our research department at Hyde Park, Mass., is equipped to consider the more exacting phases of any installation.

ATLANTA, GA. 306 Walton Bldg.
BOSTON, MASS. 555 Mass. Trust Bldg.
BUFFALO, N. Y. 100 Bedford Ave.
CHICAGO, ILL. 530 So. Clinton St.
CINCINNATI, OHIO 604 Provident Bank Bldg.
CLEVELAND, OHIO 330 Guardian Bldg.
DALLAS, TEXAS 3411 Knight St.
DETROIT, MICH. 406 Marquette Bldg.
HARTFORD, CONN. 36 Pearl St.
KANSAS CITY, MO. 3830 Park Ave.
LOS ANGELES, CALIF. 411 Hollingsworth Bldg.
MINNEAPOLIS, MINN. 804 Met. Life Bldg.
NEW YORK, N. Y. 52 Vanderbilt Ave.
PHILADELPHIA, PA. 135 No. Third St.
PITTSBURGH, PA. 711 Park Bldg.
ROCHESTER, N. Y. 1024 Granite Bldg.
ST. LOUIS, MO. 2086 Railway Exchange Bldg.
SALT LAKE CITY, UTAH 818 McIntyre Bldg.
SAN FRANCISCO, CALIF. 759 Monadnock Bldg.
SEATTLE, WASH. 1105-1106 White Bldg.
WASHINGTON, D. C. 1006 Loan & Trust Bldg.

B. F. STURTEVANT CO.
OF CANADA, LTD.
GALT, ONT.

MONTREAL 404 New Birks Bldg.
TORONTO 210 Lumsden Bldg.

SEE OUR CATALOGUE IN SWEET'S

For your convenience in securing ready information about our products there are eighteen pages of definite data in Sweet's Catalogue compiled especially in view of architects' requirements.

Deshler Hotel, Columbus, Ohio. A Sturtevant-Equipped Building
Holabird & Roche, Architects

VENTILATION is of first importance in modern hotel design—kitchens and service quarters below grade, tiers of bathrooms, public dining and ball rooms—all depend on ventilation for successful operation.

Sturtevant Equipment

is performing efficient service in many of the most important hotels of the country. The Sturtevant corps of engineers with the advantage of long experience in complicated hotel problems offers engineers a service of definite value. Let us consider heating and ventilating with you at an early stage of the plans.

B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON, MASS.

done entirely by their own plant maintenance department, and during the years of 1918, 1919 and 1920 this type of construction had been extended over 116,023 square feet of working area, including 44,916 sq. ft. of assembling galleries. At the present time this construction is being pushed forward to include the remodeling of the entire fan shop. This new shop will cover 64,235 sq. ft. including 23,873 sq. ft. of assembling galleries. Material racks are already in place along one fire wall and the entire machine equipment has been laid out so that all fan construction will proceed with a minimum of handling. The material racks are served by an electric railway truck with an automatic lift platform that permits sheets to be slid directly from the racks to the car and then run to a position for the first machining operation. Evidently this concern believes in the slogan "When times are dull, make ready for the coming boom of prosperity."

Central Station Heating Notes.

Ithaca, N. Y.—A total sum of $700,000 will be spent by Cornell University to build the new heating plant which will heat the entire university, dormitories, State Colleges of Agriculture and Veterinary Medicine, according to an announcement of the board of trustees. The plant will be built in the gully north of the East Ithaca station of the Lehigh Valley Railroad, saving a haul of 1½ miles now required to reach the university heating station at the old armory and the separate plants. It is expected that work on the plant will be begun this year.

Hornell, N. Y.—By permission of the Public Service Commission, the Hornell Electric Company will discontinue its steam heating service from May 1 to September 25. In the past the steam heat has been maintained the year round. It was claimed the expense did not justify the operation of the plant in the summer months.

Springfield, Ill.—The price to be paid by the citizens of Springfield for the heating and electric properties of the Springfield Gas & Electric Company is to be determined before June 15 by a board of arbitration, which is made up of John F. Wallace, Delos F. Wilcox and William J. Hagenah, the latter representing the Utilities company. The board has been holding hearings during the past two months.

Bloomington, Ill.—Owners of business buildings in Bloomington have organized to oppose the petition for the increase in heating rates asked for by the B. & N. Company.

Sioux City, Ia.—Sioux City is considering taking over the steam heating department of the Sioux City Service Company and making it a municipally-owned concern, according to reports from that city. R. J. Dunham, president of the company, has offered to sell the steam heating mains to the city or to any responsible company organized by its citizens for $120,000. This offer was made to a committee of citizens which will investigate the condition of the plant and determine whether the sales price is acceptable. In estimating the value of the system, the underground heating mains were valued at $110,760, the meters at $4,984, and the services at $5,227. This valuation is the same as that contained in the petition submitted to the city council recently when the service company asked for a 30% increase in its steam heating rates. Should the committee feel that the valuation is too high, the company has agreed to have the property appraised by two appraisers, one representing each side. The company's offer to sell is the outcome of the opposition to the proposed increase in heating rates. The consumers' committee had drafted a proposed ordinance which would have decreased the present rates about 20%. In the company's petition, it was shown that the company lost $45,567.69 the past year in its steam heating department. The increase asked for of 30% provided a fixed charge of 1.5 cents per square foot of radiation, installed, per month, for buildings with pressure system, or 1¼ cents per square foot of radiation installed for buildings equipped with atmospheric systems, plus a condensation charge for the first 50,000 lbs. of $1.35 per 1,000 lbs.; next 125,000 lbs., $1.25; next 125,000 lbs., $1.20; all over 300,000 lbs., $1.10, the rates being based upon the cost of generating steam at the power plant of 95 cents per 1,000 lbs.

LEHIGH

NEW YORK OFFICE

The rapid growth of the sales of Lehigh Fans and allied products has necessitated the opening of a sales office in New York City.

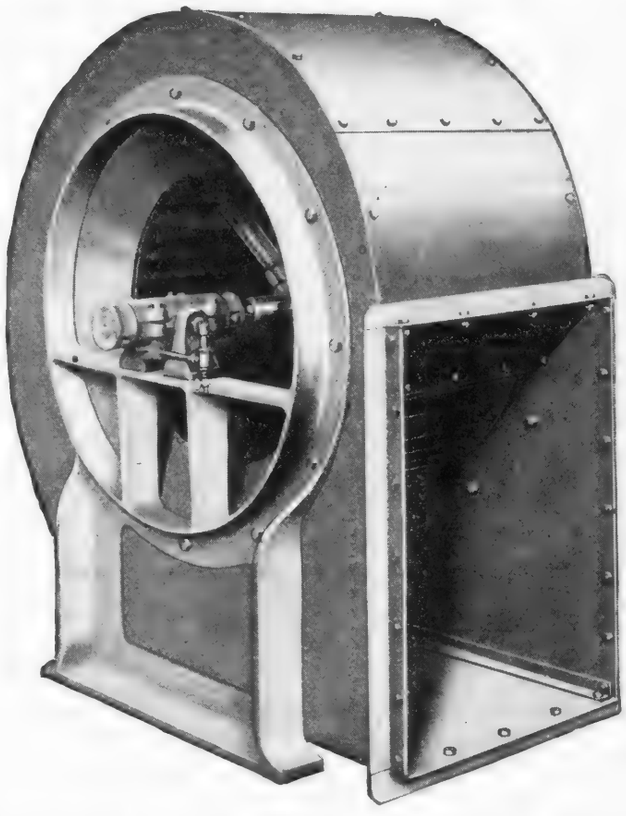
This office, under the management of Mr. F. M. Brissell, is located at 523 Singer Building.

The careful attention to detail that has stamped Lehigh service as something distinctive will be the dominant note of this—the most recently opened sales office.

HERSH BROTHERS COMPANY
655 MILL STREET
ALLENTOWN, PENNA.

The New York Blower Company

SERI-VANE FANS



Cut shows our standard type "C" Seri-Vane Fan as made in all sizes to and including number six—wheel diameter 36 inches. You will note fan is reversible as to both hand and discharge. Any special angular discharge can be readily attained with a minimum of labor. We stock all sizes of these fans so can ship any hand or discharge within twenty four hours from receipt of order at our factory.

Are you using our Mushroom Ventilators? If not, write for prices and literature and save labor of your men and your money.

THE NEW YORK BLOWER COMPANY

513 Transportation Building

CHICAGO, ILL.

Factory: Laporte, Ind.

For prompt service, write nearest sales office

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

When the company first obtained its franchise it charged 75 cents per 1,000 lbs. for first 40,000 lbs. of steam and 50 cents for all above that.

New Firms and Business Changes.

Delbrook Ventilating Co., Inc., Boston, Mass., has been organized to conduct a general sheet metal business, doing work up to No. 10 gauge. The company has taken quarters at 101 West Dedham Street, under the management of Alfred J. de l'Etoile, formerly of the George H. Priggen Company. The company is associated with the T. C. Brooks Co., 99 West Dedham St.

W. J. Scholl Co., Youngstown, O., heating and ventilating and plumbing contractors, has moved to its new building at Mahoning Avenue and Hogue Street, Youngstown.

New Incorporations.

Draws Ventilator Co., Milwaukee, Wis., capital $60,000, to manufacture ventilators. Incorporators: G. A. L. Draws, E. A. Draws, H. L. Franke and H. A. Habeck.

Shukow-Blackman Co., Brooklyn, N. Y., capital $20,000, to conduct a heating and plumbing business. Incorporators: Samuel Blackman and Soloman Blackman, 386 Bradford St., Brooklyn, and Israel Shukow, Elmhurst, N. J.

National Valve Co., Morristown, N. J., capital $100,000, to manufacture valves for steam and gas. Incorporators, Gustave F. Lowe, James H. Samuel and Edward A. Quayle, Jr.

Master Fan Corporation, Los Angeles, Cal., capital $50,000, to manufacture fans, blowers, etc. Incorporators: E. F. Jost, Gail G. Currie and W. H. C. Ness.

Ideal Ventilator Co., Providence, R. I., copital $50,000, to manufacture ventilators and ventilating equipment. Incorporators: Charles C. Richmond, Francis Horsman and Clarence E. Munroe.

Excelsior Valve Co., Saratoga Springs, N. Y., capital $40,000, to manufacture valves and other steam specialties. Incorporators: A. J. Devoe, C. L. Hoey and H. T. Ellsworth.

H. & M. Engineering Co., Pittsburgh, Pa., has applied for a State charter to manufacture steam specialties. Those interested in the company include A. W. Miller, C. Howard Hook and H. E. Gambrill.

The Cost of Bidding.

An item which enters into the building construction cost, and a large one that is seldom referred to, said Stewart A. Jellett, of the recent Philadelphia Conference on the Construction Industries, is the cost of bidding. Mr. Jellett was speaking as president of the Construction Engineers' Association of Philadelphia.

"I wonder how many men here," he continued, "have given this matter the attention it deserves. Take, for example, a suburban home to cost, say, $20,000. The owner, through his architect, may ask eight builders to estimate on the cost, each builder in turn may ask six or seven sub-contractors in each trade for bids on work in their line. The stone mason would bid on the foundations, the bricklayer on the walls, and others on the plaster, paint, plumbing, heating, electric work, roofing spouting and gutters, mantles and tile work, and numerous other branches which are necessary for the completion of the work.

"It is no exaggeration to assume that through the original eight general bidders, and assuming that many of the sub-contractors are asked for prices by several of the general contractors, and at least 75 sub-contractors may be working up estimates that enter into the cost of the construction of that one house, at an average expense of at least $25.00 for each, a total of $1,875, to tell the owner what his house will cost.

"Now, but one contractor in each trade can get the work, assuming that it is awarded. Who pays the other costs? The other owners who later employ some of these same contractors on his or their work, because the cost must be met or the contractor will fail, as they frequently do.

"The whole method of bidding on buildings is not ethical and is responsible for a very large part of the overhead cost of every builder and sub-contractor. It is

BUCKEYE
BLOWER COMPANY

Announce a further outlet for their products. We manufacture fans and blowers for

The Colby-Merrill Company
Cleveland Columbus Toledo

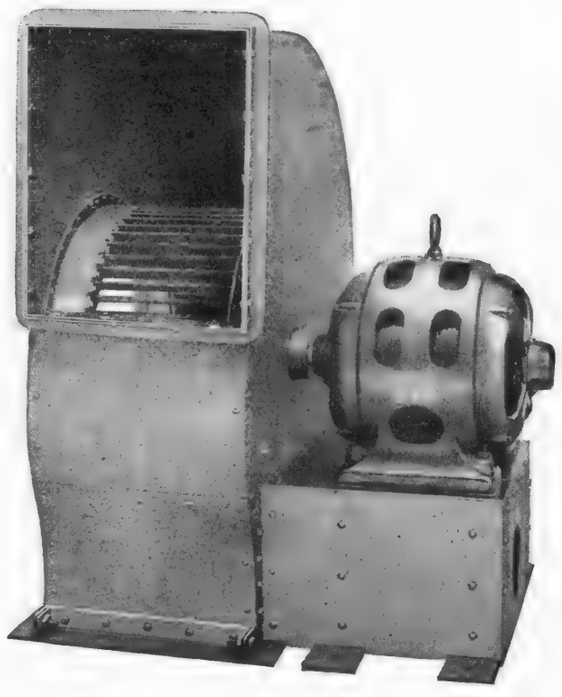
in whose name our product is marketed to the Heating and Ventilating trade in OHIO.

SERVICE ENGINEERING SALES

Write Our Nearest Office.

BUCKEYE BLOWER Co.
COLUMBUS, OHIO

ATLANTA--CHICAGO--CLEVELAND
PITTSBURG--TOLEDO



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Westinghouse
Ventilating Equipment
in the
INDUSTRIAL PLANT

W
WESTINGHOUSE ELECTRIC

Westinghouse engineers have specialized in the design of high grade equipment for ventilating work

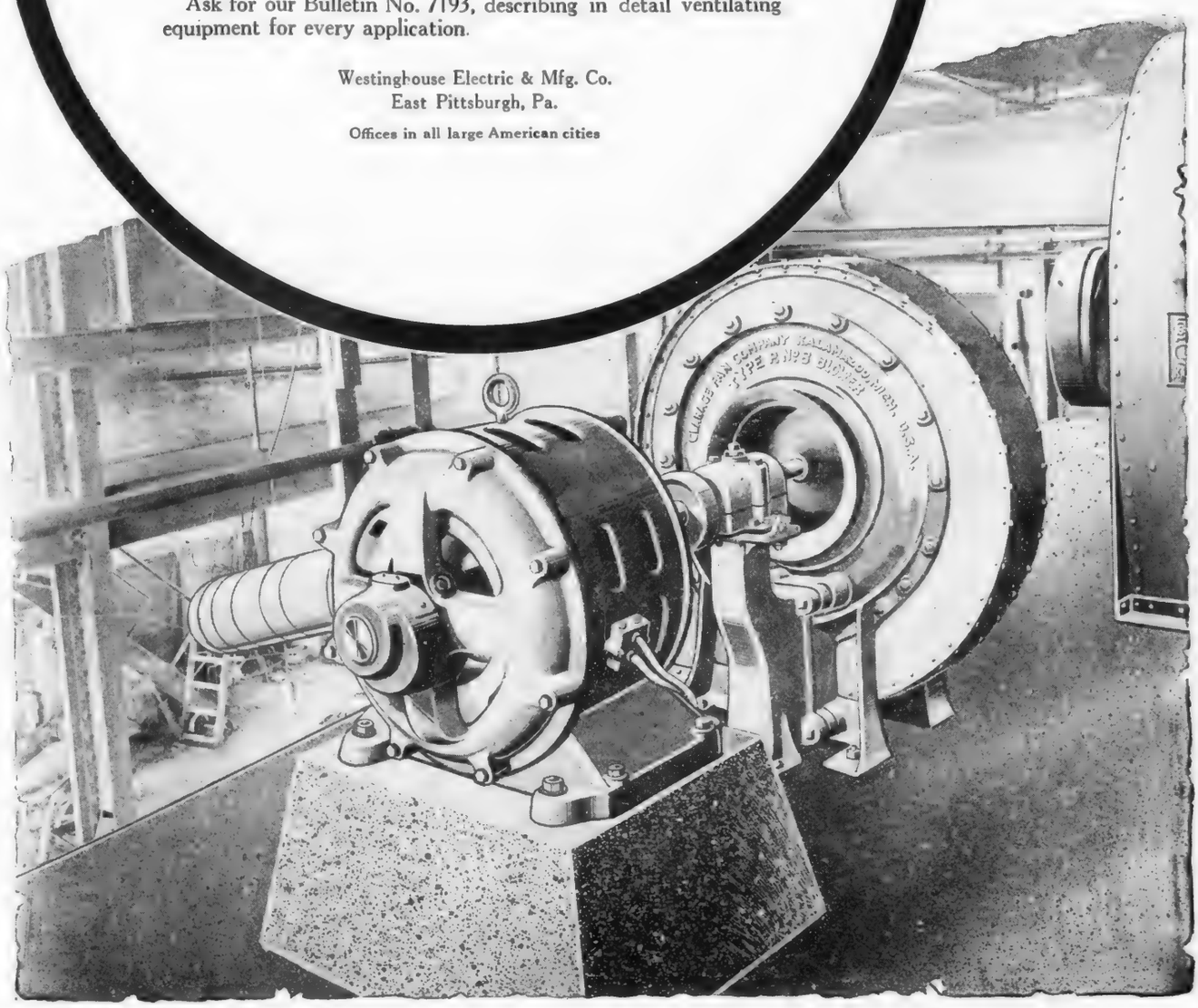
Motors and controllers have been designed for ventilating service in factory, home or school.

Big hotels, such as the Pennsylvania, in New York, and many factories and schools all over the country, are using this equipment and running it continuously day and night with practically no care or attention.

Ask for our Bulletin No. 7193, describing in detail ventilating equipment for every application.

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

Offices in all large American cities



well summed up by a contractor whom I met some time ago and whom I asked if he was busy. He replied: 'Yes, busy figuring, bye and bye I will make a mistake and get a job.'

"Imagine any other line of work on which the accumulated costs of making estimates equal from 15% to 18% of the cost of the completed construction.

"As no two buildings, generally speaking, are alike, this process of estimating must be gone through in each individual case. The whole system of the cost of bidding should be revised and can be revised to the advantage of everyone, particularly to that of the man who pays for the building."

How the National Trade Extension Bureau is Co-Operating with Traveling Salesmen.

As is well said, in a bulletin issued by the National Trade Extension Bureau, addressed particularly to the "knights of the grip," there is not anything under the sun that will make a fellow feel quite so good, or give him as much pep, as to know that his associates have confidence in him, and are back of him to help him make good.

To prove that the bureau is prepared to do its part in this connection the bulletin goes on to state that all that salesmen need to do is to write T. E. B. a personal letter about each customer that needs the bureau's help.

"Tell us where he is lame," continues the bulletin. "If his method of estimating is bad; if he doesn't know how to figure profits correctly; if he makes bad contracts and extends too much credit; if he is a poor collector and slow pay; if his bookkeeping is in bad shape; if his shop is poorly located and his display untidy; if his show windows are blank and his advertising void; if he is a poor salesman or uses bad business practices. Tell us all about him. Then we will go after him and help you develop him.

"From our position we can safely say a lot of things to him that you might not get away with. If we make him sore, you can come along and patch it up by saying: 'Well, T. E. B. ought to know what they are about, for they are certainly bringing a bunch of contractors out of some terrible holes and, if I were in your place, I would take a shot at it anyway.'"

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceeding date of issue.

WANTED—REPRESENTATIVES.

Splendid opportunity for manufacturers agents or salesmen who are in touch with architects and engineers in the building trades to sell complete and established line of stationary vacuum cleaners. Liberal commission. Good territory now open. Address "W. G. K." care Heating & Ventilating Magazine, 1123 Broadway, New York.

Heating and Ventilation
STANDARD DATA SHEETS

SOME SUBJECTS

B. T. U. Losses
Ducts and Flues
Chimneys
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One Pipe Steam Systems
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198 Sheets Covering 25 Important Subjects
Price 5 Cents per Sheet

Send for folder giving full list and special prices on sets and folder

HEATING AND VENTILATING MAGAZINE CO.
1123 Broadway, New York City

PECO

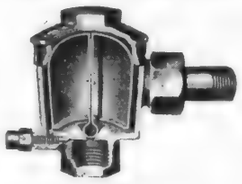
"The System with a Record"

Over thirty plants "Pecoized" for one company

20% to 40% fuel saving

Let us talk over your condition with you

The Fool-Proof Valve



Non-adjustable
Positive in action

Catolog on request

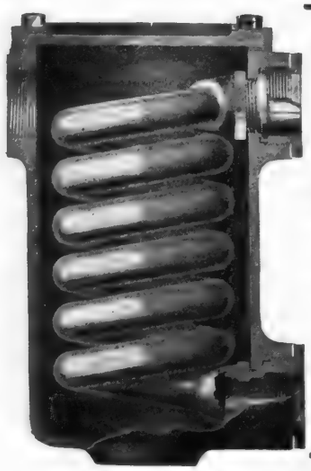
PITTSBURGH ENGINEERING CO.
Mfrs. Peco Vacuum System of Steam Heating and Drying
JEANNETTE PENNSYLVANIA

Vento Return Line Valve

for Vacuum and Vapor Heating Systems is a fuel-saver from the moment that it is put to work on the heating system. It never fails in its promise to make the heating system give dollar-for-dollar service for every ounce of fuel consumed.

Our latest Booklet "The Perfect Heating System," will be mailed on request to any heating engineer.

WM. S. HAINES & COMPANY
Philadelphia



The New Excelso Water Heater

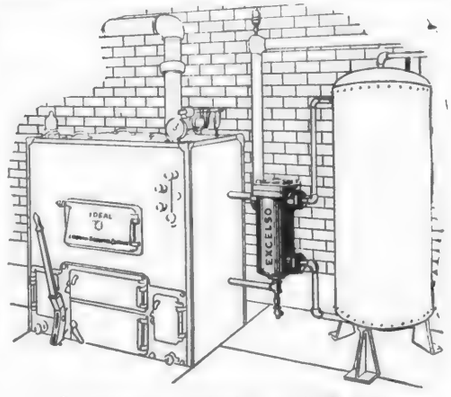
Eliminates Fire-Pot Pipe Coils

The Excelso Heater, connected below the waterline of steam or vapor boilers, will generate domestic hot water constantly, day and night, as long as there is any fire, at practically no cost.

The copper coil is connected into heater without packing. Made in five sizes for tank capacities as follows:

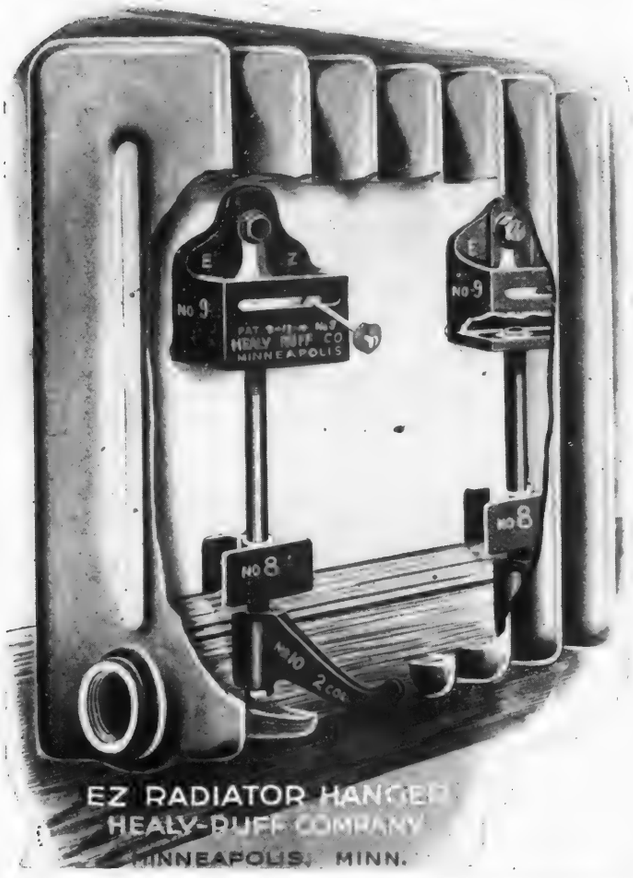
No. 11	No. 12	No. 13	No. 14	No. 15
30 gal.	45 gal.	70 gal.	90 gal.	120 gal.

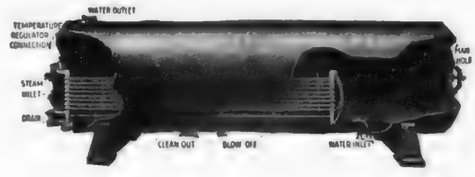
EXCELSO SPECIALTY WORKS
119 Clinton St. Buffalo, N. Y.



Connected to Ideal Type "A" Boiler

Reasonable in Price





RUSSELL STORAGE HEATER

For supplying hot water for laundries, dye houses, office buildings, apartment houses, etc.

Entire tube bundle removable, if necessity requires.

Heating surface consists of straight tubes—No "U" BENDS—tubes easily replaceable.

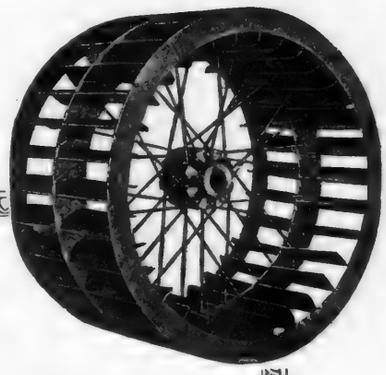
Heaters furnished either welded or riveted shells.

Made in all sizes to meet customer's requirements.

Write for Bulletin No. 240

THE GRISCOM-RUSSELL CO.
2155 West Street Building
NEW YORK

Philadelphia	Cleveland	Milwaukee	Charlotte
Boston	Toledo	St. Louis	San Francisco
Hartford	Detroit	New Orleans	Seattle
Springfield	Chicago	Houston	Los Angeles
Pittsburgh	Minneapolis	Fort Worth	Kansas City



Bayley

Heating and Ventilating equipment will stand the most searching practical and engineering tests. Satisfy yourself of this by examining equipment and performance record of hundreds of Bayley installations to which we will gladly refer you—then let our engineers make a survey and recommendation for your requirements.

Plexiform Fans

are designed to furnish a great volume of air at low velocity, at either high or low pressure, with a minimum of space and power requirement. They operate equally well in single or double widths.

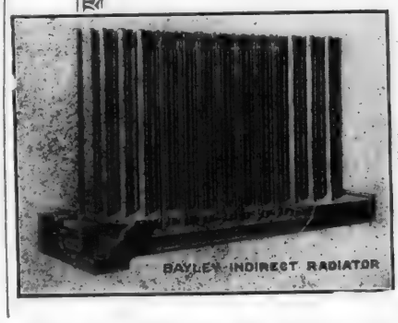
Chinook Heaters

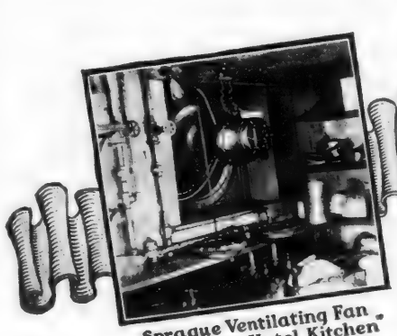
for direct or indirect heating furnish even warmth throughout the shop. They are free from return bends, elbows, and nipples, and can be shipped K. D. Each tube a complete radiator in itself.

Bayley Engineers

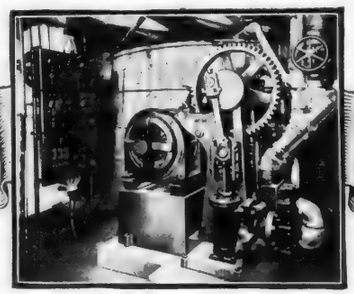
have made a life study of heating and ventilating problems. Their services are yours for the asking.

BAYLEY MFG. CO.
Dept. E
Milwaukee, Wis.





Sprague Ventilating Fan in "Mc Alpin Hotel Kitchen"



Sprague Pump Motor and control on Fire Pump "Loew's Theatre, N.Y."

Sprague Blower Motors in "Hill Publishing Plant"

SPRAGUE EQUIPMENTS SATISFY

It Pays to Put in Equipment that Satisfies

Sprague Ventilating Fans, Pump Motors, and Blower Drives have stood the test of time. You will find them doggedly doing service, day and night, down in the vitals of many conspicuous buildings in our great cities.

They can be depended upon. They are made *right* and are backed by one of the oldest manufacturers of electrical apparatus in the United States. Write our nearest Branch Office today.

SPRAGUE ELECTRIC WORKS
Of General Electric Company
Main Offices 527 W. 34th St. New York
PIONEERS OF THE INDUSTRY
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Equipped throughout with batteries of Massachusetts Fans

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MODIFIED "SQUIRREL CAGE" FANS

are especially adapted for heating and ventilating systems in Schools, Public Buildings, Factories, and Mills; the ventilation of mines, Subways, Tunnels, Drying Systems and on Board of Ship. This type of fan is used for all classes of work formerly done by the Steel Plate (or Paddle-wheel) type, but is not designed for moving materials such as shavings, wool, or grain, etc. "Squirrel Cage" Fans are made in standard sizes and capacities to meet every requirement for mechanical draft and for ventilation whether or not in connection with heating.

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Free copy of Specification and Data Sheet now ready, covers

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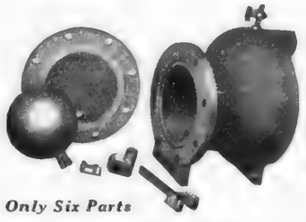

Only Six Parts

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Heating
Drips
Dryers
Pressure
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Vacuum, Etc.

The Corliss Valve Steam Trap has the fewest parts; is positive in operation, and drains the lines continuously.

Sold with an Absolute Guarantee

There is a Corliss Valve Trap for every condensation removal service.

Send us your name and we will mail you data sheet.

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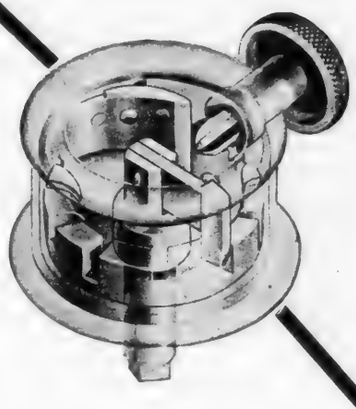
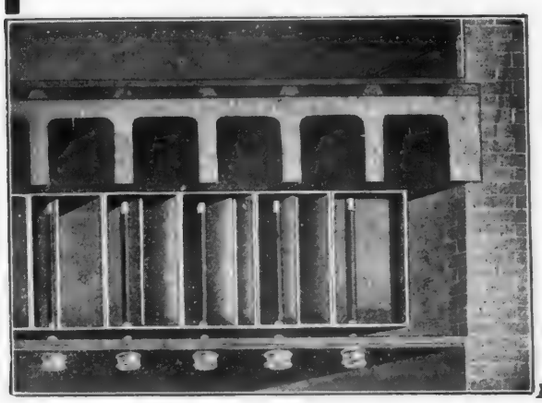
THE PERFECTO DAMPER REGULATOR AND INDICATOR



This device, when placed on a battery of ducts in the collecting chamber near the machinery room, not only affords an easy and convenient means of regulating the flow of air, but also serves as a positive means of indicating the room to which each duct leads, by means of the numbered or lettered cover windows.



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Patent Applied For

Will thoroughly drain return lines of heating systems, eliminate air without loss of vapor and return water to the boiler against pressure.

It will lift liquids to a higher level where steam or air pressure is available.

It can be placed as low as 3" above the water line of the boiler, thus making it possible to install vapor systems in basements with low ceilings.

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Thermostatic Traps—Air Line Valves—Graduated Supply Valves —Air Eliminators —Damper Regulators —Strainers

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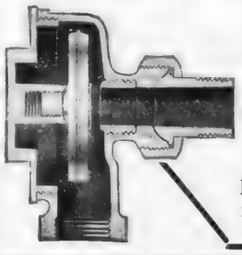
IN NAME - IN PRINCIPLE - IN SERVICE

For all Return Line Heating Systems—
Vapor, Vacuum or Straight Steam



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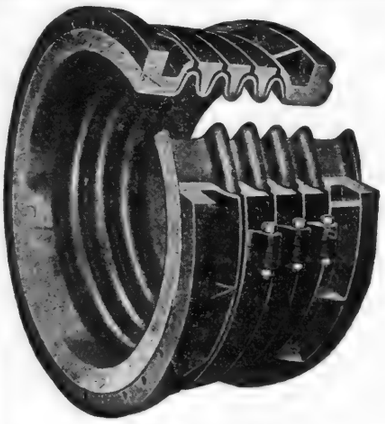

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CHANGES in temperature cause material changes in length of steam, air, water, and other pipe lines. To care for these changes safely a Badger Self-Equalizing Expansion Joint should be installed in a pipe line, otherwise the pipe joints will work loose and leak, or the fittings may become fractured, due to the irresistible strain of expansion and contraction. ***Send for our new book of complete information.***

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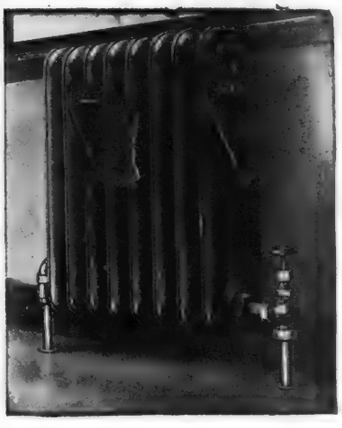

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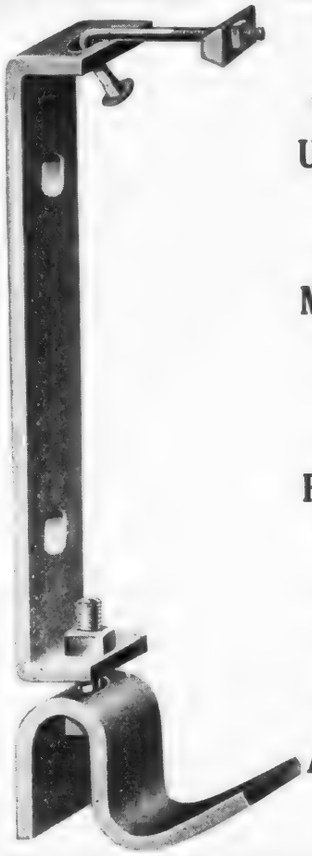
(Patented)



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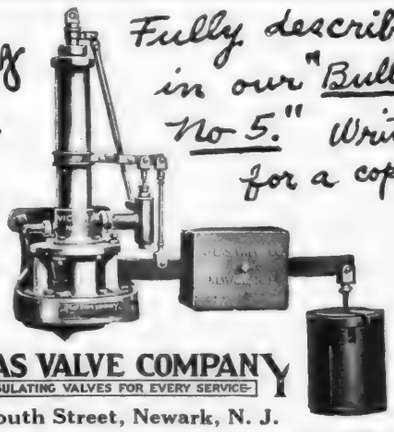

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Vacuum and Vapor Heating Specialties

Thermostatic Traps—Air Line Valves—Graduated Supply Valves—Air Eliminators—Damper Regulators—Return Traps

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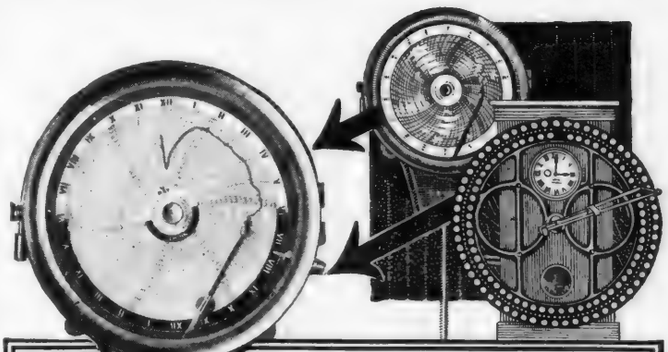

A Time Clock and Recording Thermometer in ONE

The Columbia Recording Thermometer with the new TIME PUNCH does double duty—a two-in-one-instrument. In addition to furnishing an automatic day and night record of every variation of temperature in your heat-treat process, or the regulation of heat for any purpose—it also gives a constant check on the "human element"—shows whether the man responsible for temperature control has been watching the temperature record as he should—whether he has been on the job.

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Columbia Recording Thermometers with Time Punch attachment cost no more than for an ordinary recorder alone.

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Banner Rock Wool Quilt

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Union UNION COMPOSITE DISC VALVE Disc

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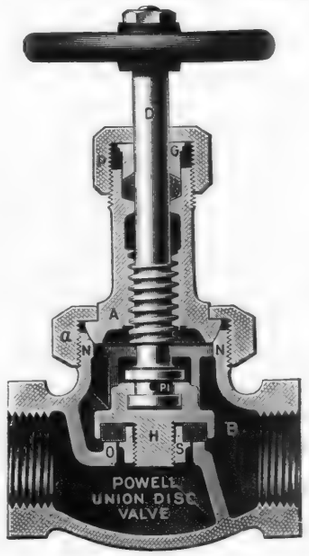

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THE WM. POWELL CO.

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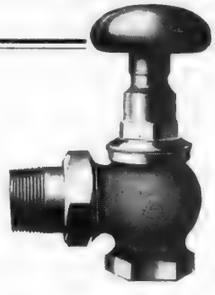

"Genuine Detroit" Packless Radiator Valves

Detroit Packless Radiator Valves are the result of years of experience in the valve manufacturing field—of a careful study of valve needs—of painstaking care on the part of our engineers.

So well do these valves qualify for efficient service—for handsome design and pleasing appearance—for complete satisfaction, that leading architects, heating engineers and master builders, the country over, recommend and specify them for jobs that require the most careful consideration.

They are made for steam, vapor and vacuum heating systems—in all necessary sizes and a variety of styles. Let us send booklet giving full information.

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Meet that Peak Demand for Hot Water

WITH A

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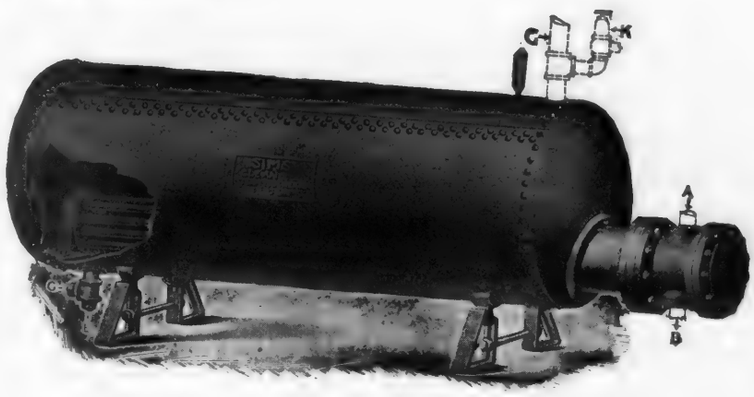

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7 TO 500 GALLONS MINUTE

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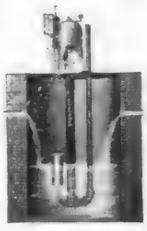

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Copper Boilers

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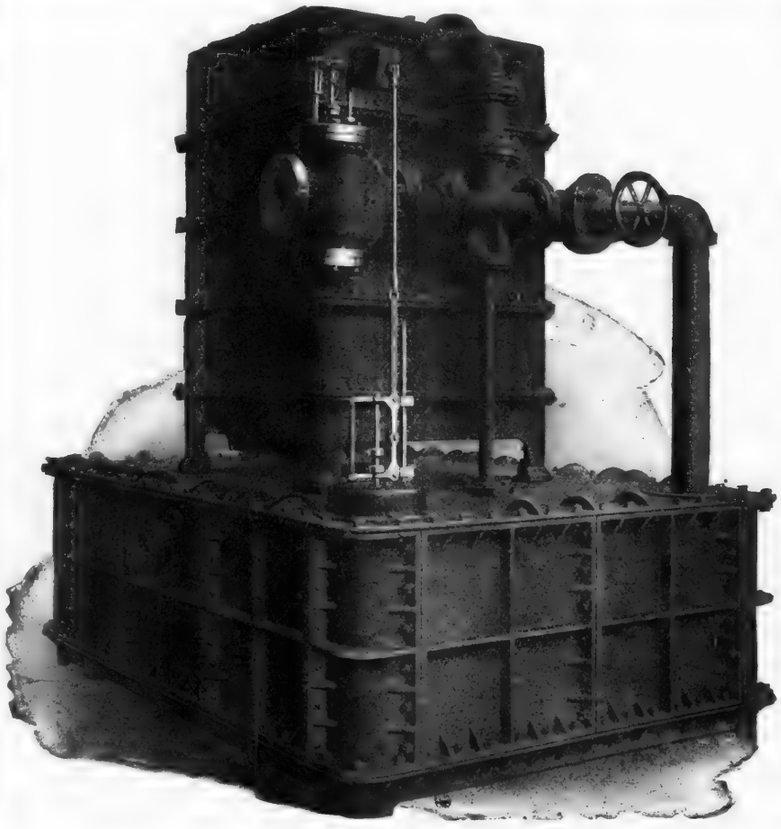

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Storage Type Water Meters

Unfailing accuracy at any rate of flow.

Offered for metering condensate, boiler feed supply or make-up water.

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The **ONLY Packless** and **Modulated** Valves in which the **Packless Feature,** although a **positive seal within itself** and **practically indestructible,** is, through a packing cushion and a very heavy special spring, **automatically re-enforced,** providing **two or double, independent, positive,** bonnet seals at **all times.**

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We specialize on high grade Radiator Valves and furnish the largest line of any company in the business

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Pump can be removed without disturbing automatic apparatus on basin cover.

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It insures a dry basement and freedom from grief. A poor one is worse than useless—insures perpetual worry. What if a good pump does cost just a little more? It saves the difference in the first emergency.

The Wise Contractor uses the best equipment he can get. And thereby escapes the "COME-BACKS."

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Profit by our life-time of specialized experience.

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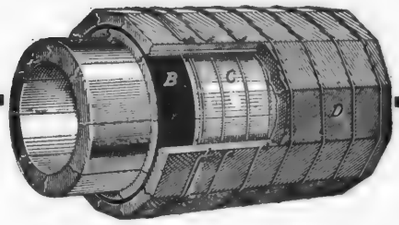

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D—Outer Shell, 1 inch thick.

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Wyckoff's
Improved
Cypress Covering

Not affected by wet and dry conditions common to steam-pipe trenches. Will not rot. Absolutely water and steam tight. Each shell is wound with extra-heavy steel wire. Coated all over with the best known preservative—**Montezuma Asphalt.**

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THE SIMPLE
RIC-WIL METHOD

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For forced and gravity circulation heating systems. Installed for such firms as Ford Motor Company, Lincoln Motor Company, American Woolen Mills, Fisher Ohio Body Company, American Can Company, U. S. Government and many others.

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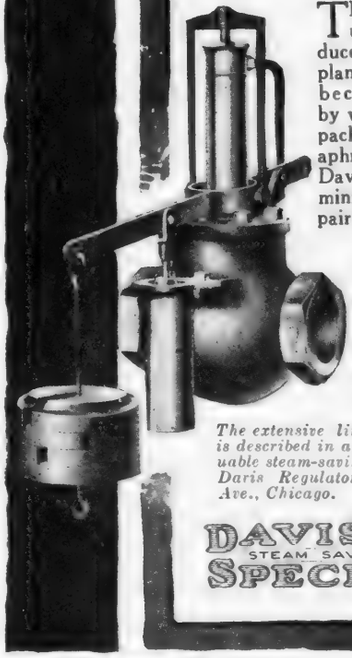

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It reduces steam to the exact lower pressure needed for heating systems. Supplies uniform pressure regardless of fluctuation in boiler pressure.

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STEAM SAVERS SINCE 1875
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Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
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Atmospheric Conditioning Corp., Phila., Pa.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F. Hyde Park, Boston, Mass.

DUST DETERMINATORS.

Atmospheric Conditioning Corp., Phila., Pa.
E. Vernon Hill Co., Chicago, Ill.

ECONOMIZERS, FUEL.

Sturtevant Co., B. F., Hyde Park, Boston, Mass.

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Hoffman Specialty Co., New York.

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Hartmann Co., Charles, Brooklyn, N. Y.

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American Blower Co., Detroit, Mich.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F. Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Steam, High Speed.

American Blower Co., Detroit, Mich.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EVAPORATORS.

Boiler Feed Make-up.

Griscom-Russell Co., New York.

EXHAUST HEADS.

Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Simmons, Co., John, New York.
Surtevant Co., B. F., Hyde Park, Boston, Mass.
Wright-Austin Co., Detroit, Mich.

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Alberger Pump & Condenser Co., New York.
American District Steam Co., No. Tonawanda, N. Y.
Budger & Sons Co., E. B., Boston Mass.
Central Station Steam Co., Detroit, Mich.
Century Conduit Co., Pittsburgh, Pa.
Crane Co., Chicago, Ill.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville, Inc., New York.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.

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American Blower Co., Detroit, Mich.
Batterman-Truitt Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Hackney Mfg. Co., St. Paul, Minn.
Hersh Brothers Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co,. New York.

FILTERS.

Aerating.

Griscom-Russell Co., New York.
Johns-Manville, Inc., New York.

Feed-water.

Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

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American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
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McAlear Mfg. Co., Chicago, Ill.
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Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

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Jas. P. Marsh & Co., Chicago, Ill.

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McAlear Mfg. Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

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American Steam Gauge & Valve Mfg. Co., Boston, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
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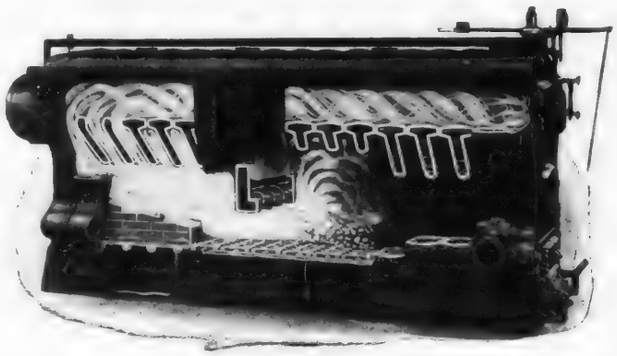

Sectional view of Imperial Super-Smokeless Boiler, showing Hot Blast Chamber.

Imperial Super-Smokeless Boilers

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Atmospheric Conditioning Corp., Phila., Pa.

GOVERNORS, PUMP.
Atlas Valve Co., Newark, N. J.
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Fulton Co., Knoxville, Tenn.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Plant Engineering & Equipment Co., New York.
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Wright-Austin Co., Detroit, Mich.

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Domestic Water.
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
American Radiator Co., Chicago, Ill.
Dahlquist Mfg. Co., Boston, Mass.
Excelso Specialty Works, Buffalo, N. Y.
Patterson-Kelley Co., New York.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water (Closed).
Alberger Heater Co., Buffalo, N. Y.
Alberger Pump & Condenser Co., New York.
Griscom-Russell Co., New York.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Simmons Co., John, New York.
Sims, Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water (Open).
Griscom-Russell Co., New York.
Sims Co., Erie, Pa.
Webster & Co., Warren, Camden, N. J.

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Griscom-Russell Co., New York.

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Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
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Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

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Moline Heat, Moline, Ill.

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Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
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Webster & Co., Warren, Camden, N. J.

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McAlear Mfg. Co., Chicago, Ill.
Moline Heat, Moline, Ill.
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Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

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Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
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Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

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Plant Engineering & Equipment Co., New York.

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Central Station Steam Co., Detroit, Mich.
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(Feed Water (Wier Type).
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Pitot Tube.
American Blower Co., Detroit, Mich.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

Steam.
American District Steam Co., No. Tonawanda, N. Y.

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Simmons Co., John, 110 Center St., New York.

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Simmons Co., John, 110 Center St., New York.

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Illinois Engineering Co., Chicago, Ill.
Johns-Manville, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Johns-Manville Co., New York.
Plant Engineering & Equipment Co., Nev York.
Simmons Co., John, New York.

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Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Plant Eng'g & Equipment Co., New York.
Yeomans Bros., Chicago, Ill.

Centrifugal.
Alberger Pump & Condenser Co., New York.
Allenclif Engineering Co., Columbus, O.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
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Allenclif Engineering Co., Columbus, O.
Chicago, Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Ideal Heating Equipment Co., Cleveland, O.
Nash Engineering Co., So. Norwalk, Conn.
Thomas Pump works, New York.
Thompson Mfg. Co., Des Moines, Ia.
Trane Co., La Crosse, Wis.
Yeomans Bros. Co., Chicago, Ill.

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Thomas Pump Works, New York.
Thompson Mfg. Co., Des Moines, Ia.
United Vacuum Appliance Division, Connersville, Ind.
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Steam.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Ideal Heating Equipment Co., Cleveland, O.
Nash Engineering Co., So. Norwalk, Conn.
Plant Engineering & Equipment Co., New York.

Turbine.
Alberger Pump & Condenser Co., New York.
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Nash Engineering Co., So. Norwalk, Conn.
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Vacuum.
American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Co., Cleveland, O.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connersville Blower Co., Connersville, Id.
Economy Pumping Machinery Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
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American Steam Pump Co., Battle Creek, Mich.
Chicago Pump Co., Chicago, Ill.
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Economy Pumping Machinery Co., Chicago, Ill.
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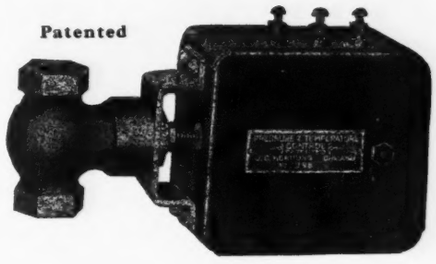

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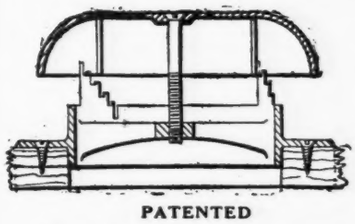

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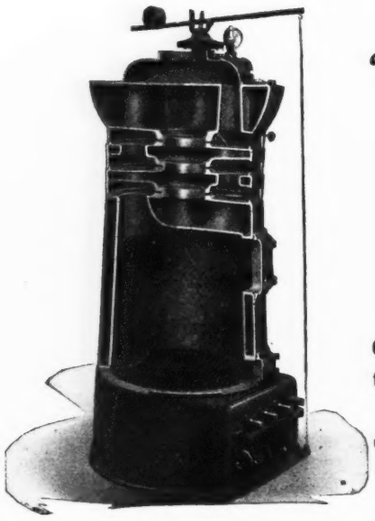

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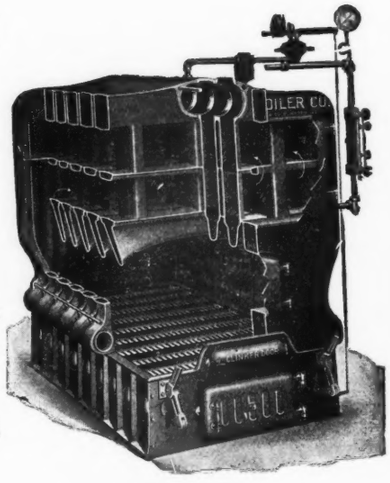

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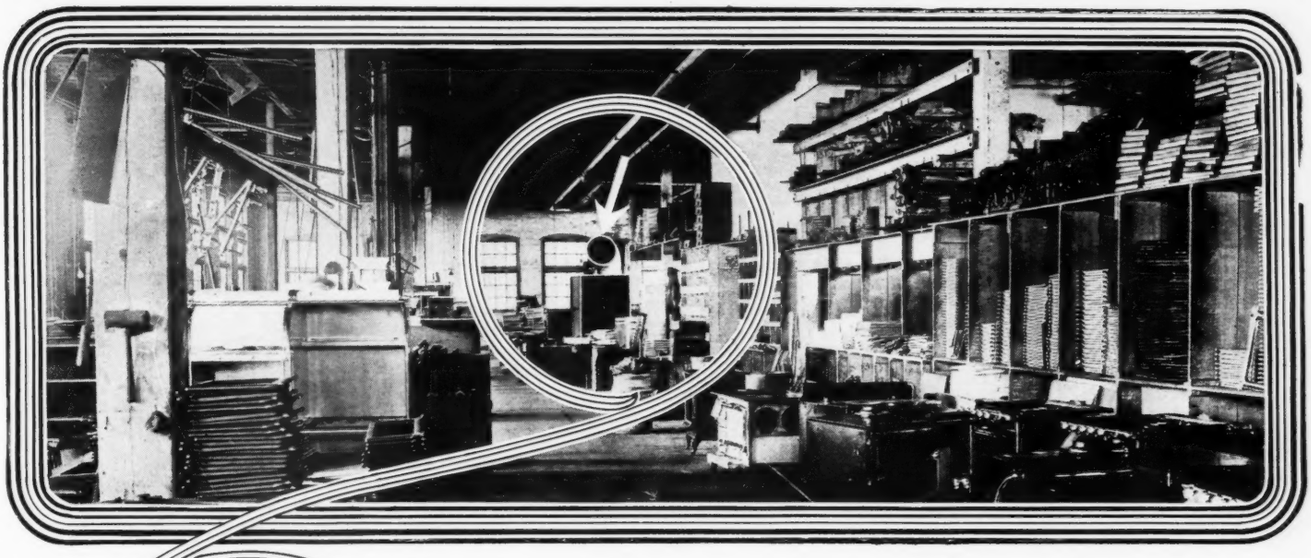

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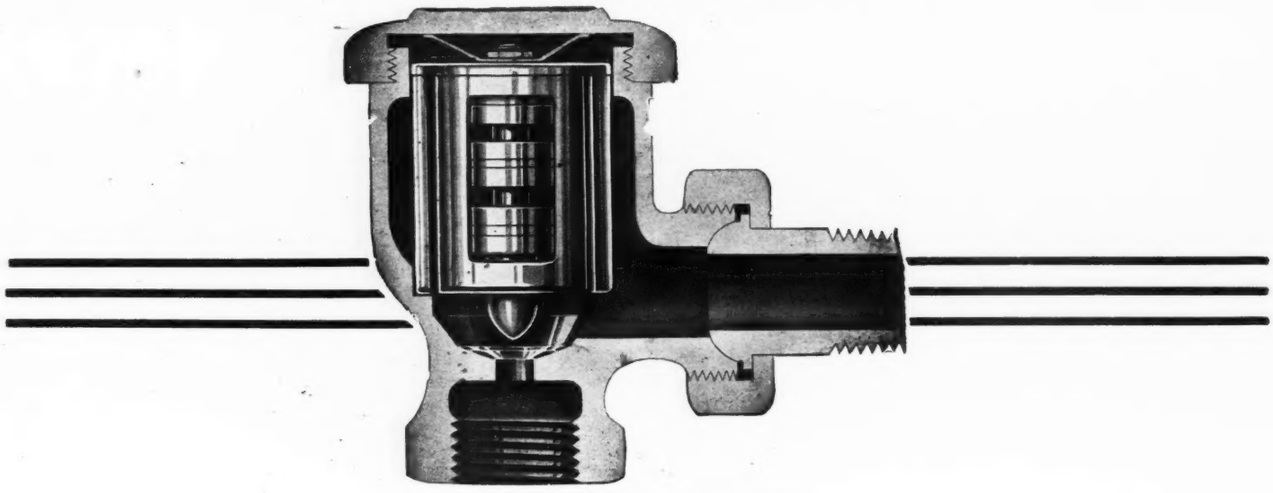

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